DOCUMENT RESUME

ED 175 770 SO 011 937

TITLE	Economic Evaluation of New Technologies in Higher Education. N.I.E. Report Phase 1, Volume 7 of 7.
INSTITUTION	Heriot-Watt Univ., Edinburgh (Scotland). Esmee Fairbairn Economics Research Centre.
SPONS AGENCY	National Inst. of Education (DHEW), Washington, D.C.
PUB DATE	Mar 78
NOTE	236p.: For related documents, see SO 011 930-936
EDRS PRICE	MF01/PC10 Plus Postage.
DESCRIPTORS	*Economic Education; *Economic Factors; *Economics; Financial Policy; Foreign Policy; Higher Education; Income; Inflation (Economics); Investment; Labor Market; Marketing; Money Systems; Policy Formation; Unemployment

ABSTRACT

Part of a series of instructional packages for use in college level economics courses, this document contains nine lecture outlines on macroeconomics. The first section deals with basic macroeconomic concepts in terms of underlying microeconomic behavior, national income and product accounting, nominal and real GNP, actual and potential GNP, and economic policy. Section II presents a simple model of income and expenditure determination. Section III focuses on aggregate demand relative to the GNP, unemployment, and inflation. Section IV discusses fiscal policy, the balanced budget multiplier, the choice of the size of the budget deficit or surplus, and endogenous taxes. Section V covers investment expenditure in the American economy, investment expenditure and the rate of interest, and other determinants of investment expenditure. Sections VI and VII deal with money and interest--in particular, saving and wealth, money and financial intermediaries, the demand for money, general equilibrium of goods and financial markets, and monetary policy. Section VIII discusses aggregate supply in terms of the labor market and the Phillips Curve. The final section deals with international economics in terms of balance of payments, foreign trade, and international monetary arrangements. Economic principles presented in the lectures are supported by concrete examples, charts, and tables. For accompanying tests, answer sheets, and study approaches, see SO 011 932. (KC)

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ED175770

Economic Evaluation of New Technologies in Higher Education.

N.I.E. Report Phase 1,

Volume 7 of 7

March 1978

THE ESMEE FAIRBAIRN RESEARCH CENTRE, HERIOT-WATT UNIVERSITY, EDINBURGH.

SP 011 937

The Esmée Fairbairn Research Centre, TEFRC, was established in 1970 and grew out of the Economics Education Project which was concerned with analysing how economics was being taught in schools, polytechnics, colleges and universities in the United Kingdom. Since its establishment, the Centre has undertaken several studies in the United Kingdom and United States of America, focussing mainly on efficiency in higher education.

Beginning in 1975, the principal research activity of TEFRC will be evaluating the cost effectiveness of alternative systems of instruction in higher education and assessing the likelihood of their diffusion in different institutional settings.

The Research Centre is part of the Department of Economics at Heriot-Watt University. The Director is Professor Keith G Lumsden.

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MACRO UNIT 1

BASIC MACROECONOMIC CONCEPTS

1.1 Underlying Microeconomic Behavior
1.2 National Income and Product Accounting
1.3 Nominal and Real GNP; Actual and Potential GNP
1.4 Economic Policy

5

LECTURE OUTLINE

1. BASIC MACROECONOMICS CONCEPTS

1.1 Underlying Microeconomic Behavior

1.1.1. Demand and supply

a. Macroeconomics is concerned with the aggregates of quantities and prices such as total output of goods and services, employment, and the average price level. In order to understand how the values of these aggregate variables are determined it is necessary to keep in mind how individual markets function. In particular, it is important to understand what determines the price and quantity of goods and services and how price and quantity respond to changes in those determinants.

b. The transactions between buyers and sellers of a commodity make up what economists call the market for that commodity. The quantity bought and sold and the price of the commodity are determined in that market.

Definitions: Commodity -- any good or service which directly or indirectly satisfies a human want.
Transaction -- the exchange of one commodity for another, one of which is usually money.
Price -- the number of dollars that is exchanged per unit of another good in a market transaction.

Examples: *A market can exist in one location, such as the stock market on Wall Street or the wheat market in Chicago. Or a market can be widely dispersed geographically, such as the retail food market.*

c. The behavior of buyers can be described in terms of a market demand curve which shows the quantities that the aggregate of buyers would be willing to buy at alternative prices. Ordinarily, the demand curve is downward sloping, indicating that buyers would be willing to buy more of the commodity at lower prices, other things the same. The negative slope is consistent with the idea that the more of a commodity buyers have, the less desirable is an additional unit of it. The position of the demand curve for a commodity will be influenced

by variables other than price, such as buyers' incomes, the prices of related commodities, etc., which influence the amount buyers would demand at each price.

Examples: *Two demand curves for automobiles are shown in Figure 1.1. They are downward sloping indicating the inverse relationship between price and quantity demanded. Curve D^1 shows automobile demand for a high price of gasoline. D^2 shows a greater demand for automobiles when there is a lower price of gasoline.*

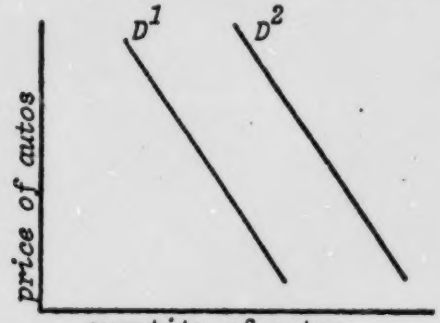


Figure 1.1

d. Seller behavior can be described in terms of the supply curve which shows the quantities that the aggregate of sellers would be willing to sell at alternative prices. Usually, the supply curve is upward sloping indicating that sellers would be willing to sell more at higher prices, other things the same. The upward slope is consistent with the notion that the more of a commodity that is produced the higher is the production cost per unit. The position of the supply curve of a commodity will depend on variables other than price, such as the prices of other commodities used to produce it, the technology used to produce it, etc., which influence the amount producers would be willing to sell at each price.

Example: *Two supply curves are shown for clothing in Figure 1.2. They are upward sloping reflecting the fact that at higher prices sellers are willing to supply more. S^1*

1.1.2. **Market equilibrium.**

a. If a market functions properly, buyers and sellers are aware of the prices at which transactions take place. In the absence of any change in the factors which determine the positions of the demand and supply curves, there is a tendency for the market price to converge to a unique level. This is because buyers want to make transactions at the lowest and sellers at the highest possible price. When sellers who would initially be willing to sell the commodity at a relatively low price observe transactions taking place at higher prices, they will no longer be willing to sell at those lower prices. When buyers who would initially be willing to buy the commodity at a relatively high price observe transactions taking place at lower prices, they will no longer be willing to buy at the higher price.

Example: *Suppose you wanted to buy a particular brand of stereo receiver very much and would be willing to pay as much as $300 for it. If you observed other transactions for that receiver being made at a price of $200, you would be foolish to buy it for even $250 if someone offered it to you for that price.*

b. In order for the market price to be at an equilibrium it is necessary that the quantities demanded and supplied at that price be equal. That is, the equilibrium market price must be where the supply and demand curves intersect. In Figure 1.4 below the equilibrium price is p*. If the market price is p*, then the amount that buyers want to buy and the amount that sellers want to sell are equal. Every buyer who is willing to pay p* will be able to find a seller willing to accept p*. The equilibrium quantity bought and sold is q*.

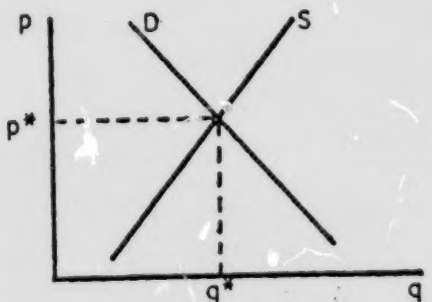


Figure 1.4

Definition: **Equilibrium** -- state of balance at which there is no tendency for the variables involved (e.g., price and quantity of a commodity in a market) to change.

c. Whenever the market price is below p* (e.g., p_1 in Figure 1.5a), there will be excess demand. If there is excess demand at the market price, then there are some buyers who are not able to find a seller and who would be willing to offer more than the market price. Since sellers can sell at least as much at a higher price, it will be in their interest to raise the prices. Consequently, when there is excess demand, competition among buyers and the desire to get the highest possible price for a given quantity will drive the price up. Only if the excess demand is eliminated will the tendency of the price to rise be eliminated.

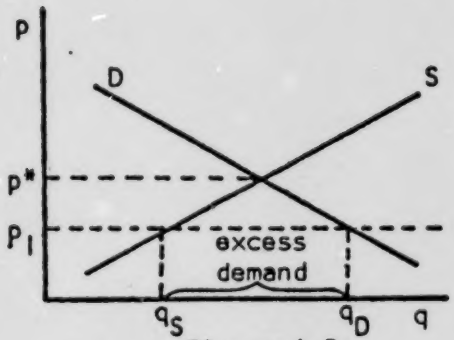


Figure 1.5a

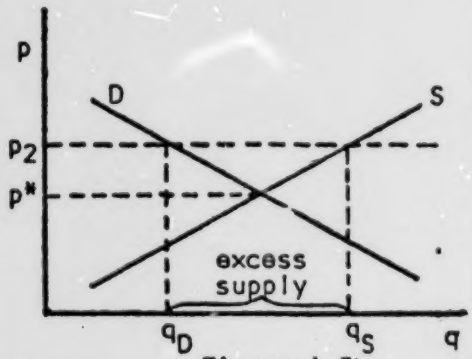


Figure 1.5b

Definition: **Excess demand** -- the situation which exists when, for a given price, the quantity that buyers demand exceeds the quantity that sellers supply.

Competition among buyers -- the effort of buyers to secure a commodity from a seller by offering, when necessary, a higher price than other buyers.

Example: ***During the oil embargo when the supply of gasoline was reduced, there was an excess demand for gasoline at the pre-embargo price. As a consequence competition among buyers and the willingness of suppliers to accept higher price led to a rise in the price.***

d. Whenever the market price is above p^* (e.g., p_2 in Figure 1.5b), there will be excess supply. If there is excess supply at the market price, then there are some sellers who are unable to find a buyer who would be willing to accept this higher price. Since buyers prefer to purchase a given quantity at a lower price, it will be in the sellers' interests to offer a lower price. As a result, when there is excess supply, competition among sellers and the desire of buyers to pay the lowest price for a given quantity will drive the price down. Only when the price reaches p^* will there be no further tendency for it to fall.

Definitions: **Excess supply** -- the situation which exists when, for a given price, the quantity supplied exceeds the quantity demanded.

Competition among sellers -- the effort of sellers to sell a commodity to a buyer by asking, when necessary, a lower price than other sellers.

1.1.3. Equilibrium at a fixed price.

a. In the description of markets presented above the price was free to adjust to the forces of supply and demand. When this is the case, the price will rise if there is excess demand and fall if there is excess supply. In some markets, however, prices are not flexible. Price rigidity can exist for any one of several reasons: the price may be fixed by the government, by non-competitive agreements among buyers or sellers, or by long-term fixed price contracts between buyers and sellers.

Examples: *For many years the government fixed the price of many agricultural products in order to maintain the incomes of farmers. In the markets for many types of labor, the wage (price of labor) is fixed by agreements determined in collective bargaining.*

b. In markets where the price is fixed, the amounts bought and sold are equal, but the quantities demanded and supplied will usually not be equal. If the fixed price is below the free market equilibrium price, then there will be excess demand as in Figure 1.6. At $\bar{p}$ the

amount bought and sold is q_S which is the same as the quantity supplied. However, the quantity demanded is q_D and there is excess demand equal to $(q_D - q_S)$.

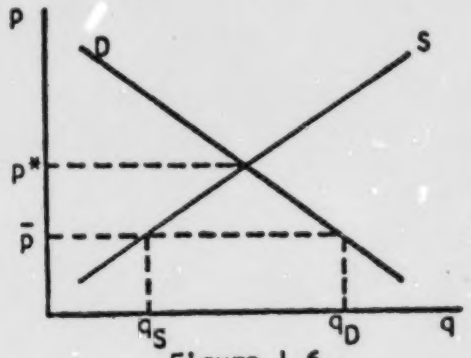


Figure 1.6

Example: *In the market for gasoline during the oil embargo, the government imposed a price ceiling which was below the price where supply and demand would be equal. As a result there was excess demand which was reflected in the long lines of motorists at gas stations.*

c. If a fixed price is imposed in a market at a level above the equilibrium price, then there will be excess supply as in Figure 1.7. At a price of $\bar{p}$ the quantity bought and sold in this case is equal to q_D which is the quantity demanded. However, at $\bar{p}$ the quantity supplied is q_S causing there to be excess supply equal to $(q_S - q_D)$.

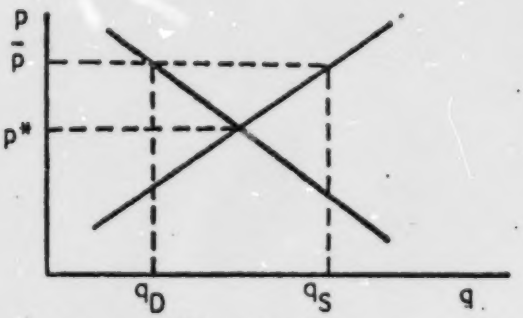


Figure 1.7

1.1.4. Circular flow

a. The economy's population can be considered to be composed of many households, some of which are individuals, the rest of which are families. Each household performs several activities. First, it acts as a consumer in satisfying its current wants. As such it buys goods

and services from producers. Second, it is an owner of goods and services which can be used to produce other goods and services. As such it sells goods and services to producers.

Example: *A typical household will buy food, clothing, etc. It will also sell labor services, and perhaps the services of other commodities they own, such as real estate.*

Households may also act as producers, selling the goods and services they produce, and buying productive goods and services from other households.

Example: *A single family farm household acts as consumer, owner of productive resources (land and labor) and producer.*

b. Several households may jointly own businesses which exist for the purpose of using some goods and services to produce others. While these businesses operate separately from households, they act on behalf of those households which own them. Like households which act as producers, businesses buy from and sell to households in different markets.

Example: *Both General Motors and the corner grocer are owned by households. General Motors is owned by many thousands of households, while the corner grocer may be owned by only one. As with most other businesses, both of these operations buy commodities in some markets (e.g., labor services) and sell commodities in other markets (e.g., autos and food).*

Similarly, households may collectively, through the political system, empower the government to use some goods and services to produce others. While the government operates separately from households, it acts on their behalf.

Example: *The government buys labor services, and other goods and services to produce government services such as national defense, police and fire protection, etc.*

c. For a simplified economy it is possible to classify markets into two groups. The markets for goods and services that producers buy from households and the markets for those commodities that producers sell to households. For such a simplified economy, there is a circular flow of income and expenditure among households and producers as shown in Figure 1.8. Households sell services (e.g., labor) to producers which are needed to produce other commodities. In turn they use the income they receive to purchase the goods and services which are sold by producers.

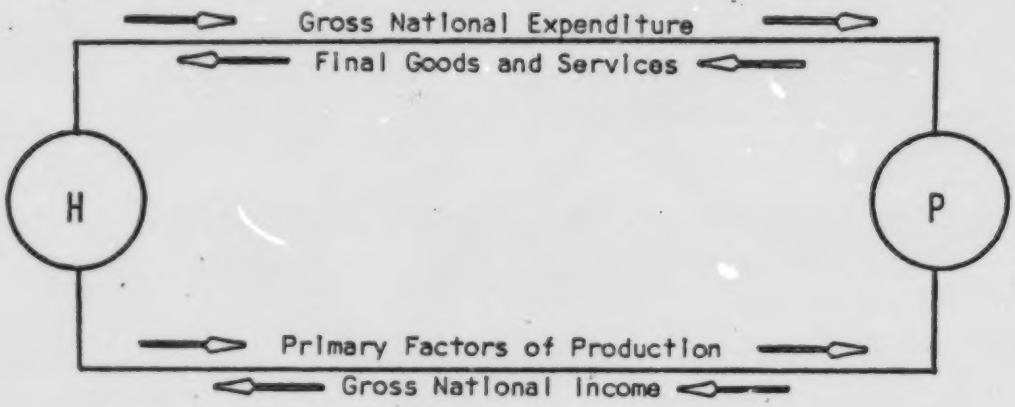


Figure 1.8

1.2. National income and product accounting

1.2.1. Gross national product

a. By observing the circular flow of income and expenditure, it is possible to measure the aggregate rate of output. This is the total of all goods and services produced by all producers in a given time period, usually expressed at an annual rate. The economy's rate of aggregate output is called gross national product (GNP).

Definitions: **Rate of output** -- the amount of output produced per unit of time.

Annual rate of output -- the amount of output produced per year.

Example: *Frequently, GNP is measured for a quarter of a year (e.g., January through March), but expressed at an annual rate. The reported number is the amount of output that would be produced if the economy continued to produce at that rate for one year.*

b. GNP is the market value of final goods and services produced. This can be measured by the expenditure for final goods and services, i.e., gross national expenditure. This value of intermediate goods and services is included in the expenditure for final goods and services. To add together the expenditure for final and intermediate goods and services would involve double counting of intermediate goods and services. In computing GNP from expenditure flows, it is therefore necessary to omit intermediate goods.

Definitions: Final goods and services -- All goods and services not used up in the production of other goods and services during the time period of observation.
Intermediate goods and services -- Any goods and services used up in the production of other goods and services during the period of observation.

Example: *Consider the output of two commodities, automobiles and steel. Suppose steel is used only to produce autos, and the market value of these goods produced this year was as follows:*

Automobiles	*$30 billion*
Steel	*10 billion*

Because the steel is used up in the production of autos, part of the market value of the autos comes from the steel used to produce them. Consequently, if the value of autos and the value of steel produced are added together, the value of the steel will be counted twice.

c. GNP can be derived in a different manner by adding together the value added to aggregate output by each producer. The sum of expenditure for final goods and services is equal to the sum of values added in the production of final and intermediate goods and services.

Definition: Value added by a producer -- the value of goods and services produced less the value of the intermediate goods used up.

Example: *Consider again the production of automobiles and steel. Suppose that steel is the only intermediate goods used in producing automobiles and that no interemediate goods are used in producing steel. The final product and the value added of the auto and steel industries and their combined contribution to GNP are as follows:*

	Expenditure for final product	*Value added*
Autos	*30*	*20*
Steel	*0*	*10*
Aggregate output	*30*	*30*

As can be seen, the aggregate output of autos and steel can be obtained by adding up expenditure for final products or by adding up values added.

1.2.2. Income equals expenditure.

a. In addition to the intermediate goods, there are other inputs which are used in the production of an industry's output of final and intermediate goods and services. These other inputs are primary factors of production. They include labor, land (or natural resources), and capital goods.

Definition: Primary factors of production -- All inputs used to produce output in the current period, not including inputs that are themselves produced in the current period.

Example: *Labor services are primary inputs because they are used to produce current output, but are not themselves produced. Buildings and machinery produced prior to the current period are primary factors since they are used to produce current output, but are not themselves produced in the current period.*

b. The income earned by the owners of primary factors employed by a producer must be paid for out of the receipts of the producer. Wages and salaries are paid in return for the use of labor services. Rent is paid in return for the use of land and capital goods not owned by the producer.

Definition: **Income** -- the payment to the owner of a factor of production in return for the use of that factor in the producti of output.

c. The income received by the owners of the business in return for the non-labor inputs they have provided is whatever is left of total receipts after payment for intermediate goods and other primary factors of production. Out of this residual income, the producer must pay interest to those households who may have loaned the owners money to enable them to purchase the land and capital they own. The amount remaining after paying interest is called gross profits.

d. Gross profit is a payment to primary factors that is the residual of receipts after payments for all other inputs have been made. Consequently, the sum of payments by a producer for intermediate goods and for primary factors of production equals total receipts from sales of output. It follows that a producer's value added is equal to the sum of its payments to primary factors. This can be seen clearly by studying the following example.

Example: *Consider the following account of a producer's receipts and payments:*

Receipts		*Payments*	
Sales	*$100*	*Intermediate goods*	*$35*
		Wages and salaries	*30*
		Rent and interest	*15*
		Profit	*20*
Total receipts	*100*	*Total payments*	*100*

Total payments equal total receipts because one form of payment is, by definition, what is left of receipts after all other payments have been made. By subtracting purchases of intermediate goods from both sides, the producer's accounts can be reconstructed as follows:

Sales	*$100*	*Wages and salaries*	*$30*
Less: purchases of intermediate goods	*35*	*Rent and interest*	*15*
		Profit	*20*
		Payments to primary factors of production	*$65*

The receipts side adds up to the producer's value added. The payments side adds up to the producer's payments of income to owners of primary factors of production.

e. Since GNP equals the sum of producers' values added, GNP is also equal to the sum of producers' payemtns to primary factors of production. That is, gross national product equals gross national income. Since gross national product also equals gross national expenditure, it follows that gross national expenditure and gross national income are equal. That is, as shown in Figure 1.9, the flow of expenditure for final goods and services equals the flow of income payments for primary factors of production.

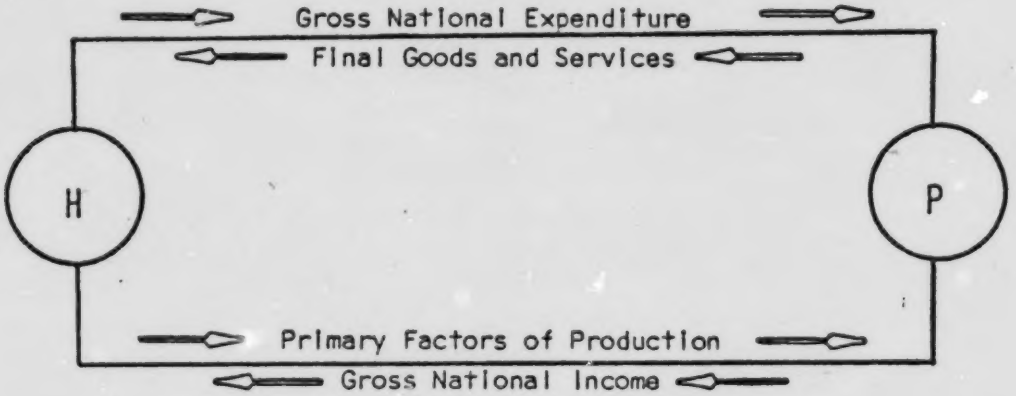


Figure 1.9

1.2.3 Distribution of national income

a. Individually or collectively, all factors of production are owned by households. All labor is directly owned by individual households. Some land and capital goods are owned directly by households. Much of the economy's land and capital goods are owned by businesses, which means that they are owned collectively by the households who are the owners of the businesses. Some land and capital goods are owned by the government, which means that they are owned collectively by all households.

Example: *Ford Motor Company owns the factories used to produce automobiles, but Ford Motor Company is owned by its many stockholders who, therefore, collectively own those factories.*

b. Although the income earned from using those factors of production to produce goods and services (gross national income) ultimately belong to households who own them individually or collectively, not all of that income is received as disposable personal income. Some of it is kept by businesses rather than paid out to their owners. That is, through the business decision-making process the households who own them choose to keep part of their income in their businesses to spend collectively. The gross profit of businesses is divided into three parts: Capital consumption allowances, undistributed corporate profits, and dividends. Gross profits less capital consumption allowances equals net profits. Capital consumption allowances plus corporate profits make up what is called business retained earnings. Dividends are an element of disposable personal income.

Definitions: Disposable personal income -- the sum of income payments to households available to be spent by individual households.

Capital consumption allowances -- the income payment necessary to cover the cost of depreciation on capital goods used in production.

Undistributed corporate profit -- that part of net profits retained by corporations.

Dividends -- that part of net profits paid out to the owners of corporations.

c. Part of gross national income is paid to the government in the form of taxes. Total tax revenue is composed of household taxes (primarily personal income taxes), direct business taxes (primarily corporate profits taxes), and indirect business taxes (primarily sales taxes). Some of the income received by the government is passed on to households in the form of transfer payments (primarily social security payments and welfare payments). The difference between taxes and transfer payments will be called net taxes.

d. Gross national income is divided among disposable personal income, business retained earnings, and net taxes, as can be seen in the following table.

Disposable personal income	=	wages, salaries, rents, interest
	+	dividends
	-	taxes
	+	transfer-payments
Business retained earnings	=	net profits
	+	capital consumption allowances
	-	direct business taxes
	-	dividends
Net taxes	=	indirect business taxes
	+	direct business taxes
	+	personal taxes
	-	transfer payments

Put another way the disposable income of households equals gross national income less business retained earnings and net taxes. This distribution of spendable income among households, businesses and government can be seen by studying the income half of the detailed circular flow diagrum shown in Figure 1.10.

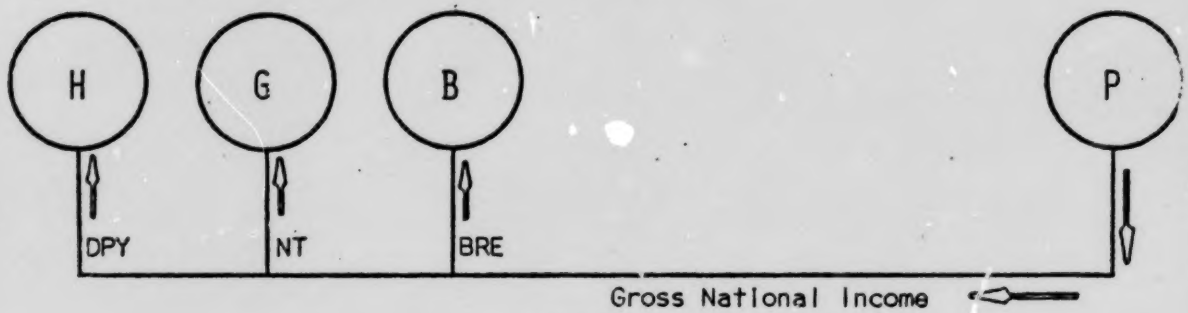


Figure 1.10

1.2.4. Components of total expenditure

a. The bulk of total expenditure for final goods and services takes the form of **consumption expenditure.** The personal disposable income not used for consumption expenditure takes the form of **saving.** Household saving is made available to government and businesses, through households acquisition (directly or indirectly through financial institutions) of financial instruments such as government bonds and corporate stocks and bonds.

Definitions: **Consumption expenditure** -- the purchase of goods and services, such as food and electric power, by individual households to satisfy wants in the present.
Saving -- income received in the current period, but not used for consumption expenditure; saving increases household's capacity to satisfy wants in the future.

Example: *In 1975 households had disposable income of $1081 billion and spent $973 billion for consumption of goods and services. Their saving of $108 billion was used to accumulate financial assets whereby their saving was made available to government and business to spend.*

b. Just as businesses may act on behalf of households as producers, they may act on behalf of households in purchasing newly produced productive assets. Consequently, a second component of gross national expenditure is **gross investment expenditure**. This takes several different forms: business plant and equipment, residential construction, and inventory accumulation.

Definition: **Gross investment expenditure** -- business purchase of goods not used up in production in the current period.

Example: *In 1975 gross investment expenditure amounted to $184 billion.*

c. Part of gross investment expenditure is used to replace depreciated capital goods. It will be recalled that capital consumption allowances are the income payment necessary to cover the cost of depreciation on capital goods used in production. Gross investment expenditure minus capital consumption allowances equals **net investment**.

Definition: **Net investment expenditure** -- the amount by which the stock of capital goods increases as a result of purchases of new capital goods (gross investment expenditure) after taking into account the depreciation on existing capital goods (depreciation expense).

Example: *In 1975 gross investment expenditure amounted to $184 billion, while capital consumption allowances amounted to $161 billion. This means that net investment expenditure*

-- the increase in the stock of capital goods -- amounted to only $23 billion.

d. The government may also act on behalf of households in purchasing final goods and services. Therefore, the third component of gross national expenditure is government expenditure. This takes the form of collective consumption expenditure (such as national defense spending and police services) and collective investment expenditure (such as construction of highways and public buildings) on behalf of all households.

Definition: Government expenditure -- the purchase of final goods and services by government.

Example: In 1975 government expenditure for goods and services was $339 billion of which $275 billion was financed from net taxes and $64 from household saving.

e. Not all purchases by domestic households, businesses, and government are from domestic producers. Some goods and services are imported from foreign producers. Similarly not all goods and services sold by domestic producers are purchased by domestic households, businesses, and government. Some are exported to foreign buyers. Net exports equals the difference between foreign expenditure for domestically produced output (exports) and domestic expenditure for foreign produced output (imports).

Example: In 1975, exports totalled $148 billion, imports $128 billion, and net exports $20 billion. That is, Americans bought $20 billion less than they sold abroad.

f. Gross national expenditure equals the sum of consumption, investments, and government expenditure plus net exports. The breakdowns of total expenditure among its components can be understood by studying the expenditure half of the circular flow diagram which has been added to the income half shown in Figure I.II.

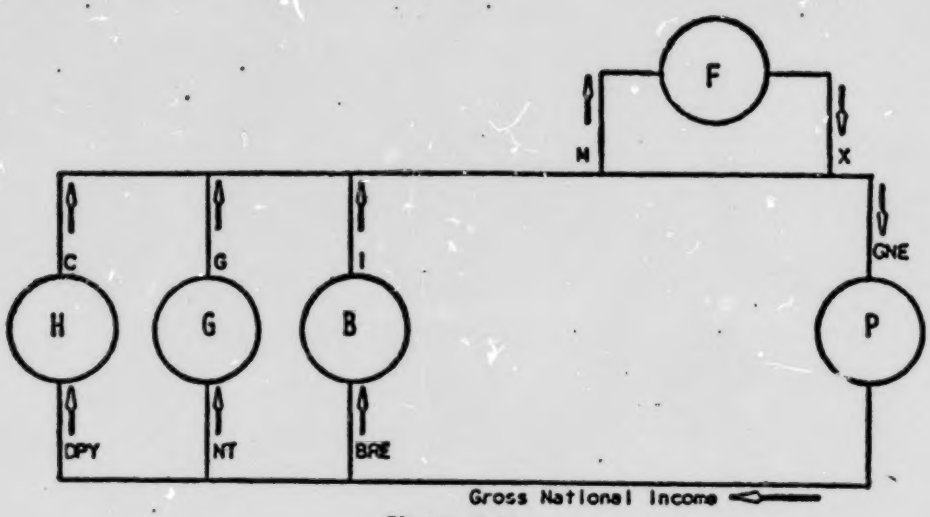


Figure 1.11

Example: *The following table shows the breakdown of GNP into components of expenditure and spendable income for 1975.*

Expenditure	*(billions of dollars)*	*Income*	
Consumption	*973*	*Disposable Personal Income*	*1081*
Investment	*184*	*Business Retained Earnings*	*160*
Government	*339*	*Net Taxes*	*275*
Net Exports	*20*		
Gross National Expenditure	*1,516*	*Gross National Income*	*1,516*

1.2.5. Financial flows between sectors

a. While gross national expenditure and gross national income are equal (See section 1.2.2.e), expenditure and income are not necessarily equal for individual sectors of the economy. But since in the aggregate expenditure and income must be equal, an excess of expenditure over income (a deficit) must be offset by an excess of income over expenditure (a surplus) in other sectors.

b. Usually, the household sector runs a surplus which is called personal saving. This income is used to acquire financial assets of some kind, such as currency, bank deposits, government bonds, corporate stocks and bonds, etc. Household purchases of financial assets are frequently called investment. Sometimes the use of the term investment when referring to personal financial investment and to business investment expenditure causes confusion. As will be seen below, the two types

of investment are not completely unrelated. Personal financial investment in the form of corporate bonds and stocks, for example, provides funds to businesses which are used to make business investment expenditure.

c. For the United States in most years the other sectors of the economy have run a deficit. That is, their expenditures for goods and services have exceeded their shares of gross national income. It is possible for these sectors to run a deficit by obtaining the use of personal saving through the sale of financial assets to the household sector. That is, the purchase of these assets by households provides funds to the sectors selling them which are used to purchase goods and services from producers.

Example: *Consider the following components of income and expenditures for the U. S. economy for 1975.*

Sector	*Spendable Income*	*Expenditure*	*Surplus (+) or Deficit (-)*
Households	*1081*	*973*	*+108*
Business	*160*	*184*	*-24*
Government	*275*	*339*	*-64*
Foreign	*0*	*20*	*-20*
National	*1516*	*1516*	*0*

The household sector had personal saving which was offset by the deficits of the business, government and the foreign sectors. These sectors obtained the use of the saved income by selling to the household sector assets, such as currency and bonds (by the government) and stocks and bonds (by businesses, both foreign and domestic).

d. Some of the transfer of funds from households to other sectors is made indirectly through financial institutions such as banks, savings and loan associations, etc. That is, households deposit personal savings in a bank or other institution which in turn acquires financial assets from businesses or government.

e. The flow of funds between sectors can be summarized in terms of the dashed lines in the circular flow diagram shown in Figure 1.12.:

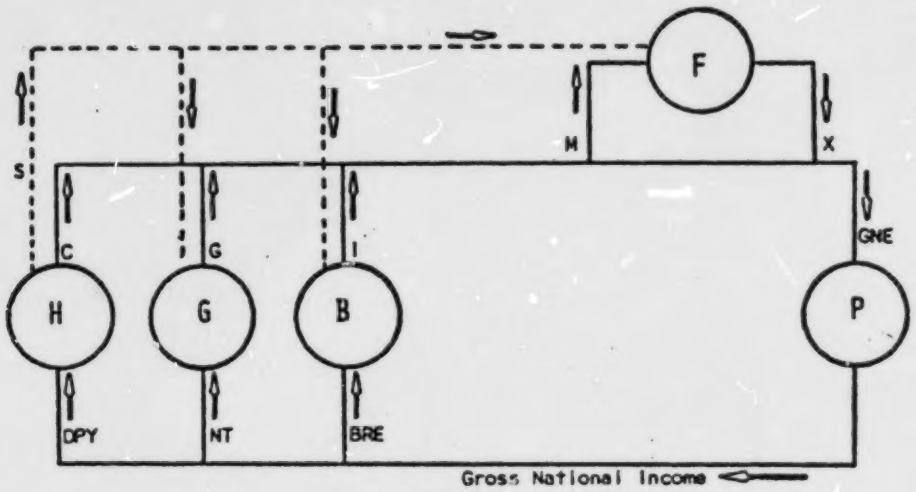


Figure 1.12

1.3. Nominal and Real GNP; Actual and Potential GNP

1.3.1. Real GNP

a. The concept of GNP discussed in section 1.2 uses expenditure for final goods and services to obtain a measure of total output. Implicitly, different goods and services are counted by weighting each unit in proportion to its price so that GNP is the sum over all final goods and services of the price times the quantity of each. By weighting each commodity by its price, GNP counts each in proportion to what buyers are willing to pay, i.e., in proportion to its value to buyers. Thus, GNP is a measure of the value to buyers of output produced.

Example: *If there were two goods, a and b, then GNP would be measured as follows:* $GNP = p_a q_a + p_b q_b$. *If GNP were measured by simply adding quantities produced, i.e.,* $GNP = q_a + q_b$, *then a piece of bubble gum would be counted to be as much output as a television set.*

b. One of the principal purposes for obtaining measures of national output is to make comparisons over time., i.e., to determine if, and by how much, output has increased or decreased. As defined above, GNP is not useful for this purpose, because it does not distinguish changes in the quantity of goods and services produced from changes in the prices of goods and services produced.

Example: *If the quantities of all goods and services remained unchanged from one year to the next, then national output would be unchanged. If, however, the price of each commodity doubled over the same period, expenditure for final goods and services would double and, consequently, GNP would double. In this case, the change in GNP is not an accurate measure of the change in national output.*

c. What is required is a measure of output which changes as quantities produced change, but which does not change when prices change. This is obtained by weighting the quantities in different time periods by the same set of prices. Such a measure is called GNP in constant prices, or real GNP, as opposed to nominal GNP.

Definitions: Nominal GNP -- expenditure for final goods and services valued in current prices; sometimes called "money GNP".
Real GNP -- expenditure for final goods and services valued in constant prices.

Example: *Suppose an economy had two goods, apples and bread. Nominal and real GNP could be calculated for two years by using year one prices to value quantities in both year 1 and year 2 as follows:*

	Year 1	Year 2
Nominal GNP	$p_{a1}q_{a1} + p_{b1}q_{b1}$	$p_{a2}q_{a2} + p_{b2}q_{b2}$
Real GNP in year 1 prices	$p_{a1}q_{a1} + p_{b1}q_{b1}$	$p_{a1}q_{a2} + p_{b1}q_{b2}$

1.3.2. The average price level

a. From the data for nominal GNP and real GNP for different years it is possible to construct an index of the average price level for those years. Such an index would show whether, on average, prices have increased or decreased from one year to another. The value of this index for any year can be obtained by dividing nominal GNP by real GNP for that year. This average price index is called the GNP deflator.

Definition: Average price index -- the ratio of the average price in successive years to the average price in a particular year, called the base year.

Example: *In 1975, nominal GNP was $1,516 billion and real GNP in 1972 prices was $1,191 billion. The value of the GNP deflator for 1975 was 1.27. This means that the ratio of the average price in 1975 to the average price in 1973 was 1.27, or in other words, the average price in 1975 was 27 percent higher than the average price in 1972.*

b. Computing the GNP deflator for any year by dividing nominal GNP by real GNP is equivalent to dividing the average price level in that year by the average price level for the base year, using current year quantities to weight prices in both years. This can be seen from the following computations for years 1 and 2, with year 1 as the base year and year 2 as the current year, for two commodities, apples and bread:

$$\text{Average price level year 2} = p_{a2}\frac{q_{a2}}{q_{a2}+q_{b2}} + p_{b2}\frac{q_{b2}}{q_{a2}+q_{b2}}$$

$$= \frac{p_{a2}\,q_{a2} + p_{b2}\,q_{b2}}{q_{a2}+q_{b2}}$$

$$\text{Average price level year 1} = p_{a1}\frac{q_{a1}}{q_{a1}+q_{b1}} + p_{b1}\frac{q_{b1}}{q_{a1}+q_{b1}}$$

$$= \frac{p_{a1}\,q_{a1} + p_{b1}\,q_{b1}}{q_{a1}+q_{b1}}$$

$$\text{Average price index year 2} = \frac{\text{average price level year 2}}{\text{average price level year 1}}$$

$$= \frac{\dfrac{p_{a2}\,q_{a2} + p_{b2}\,q_{b2}}{q_{a2}+q_{b2}}}{\dfrac{p_{a1}\,q_{a1} + p_{b1}\,q_{b1}}{q_{a1}+q_{b1}}}$$

$$= \frac{p_{a2}\, q_{a2} + p_{b2}\, q_{b2}}{p_{a1}\, q_{a1} + p_{b1}\, q_{b1}}$$

$$= \frac{\text{nominal GNP Year 2}}{\text{real GNP Year 2}}$$

Put the other way around, real GNP in the current year is equal to nominal GNP divided by an average price index constructed using current year quantity weights.

Example: *In 1975 nominal GNP was $1516 billion. In the same year the GNP deflator was 1.27 as compared to 1.00 in 1972. GNP in 1972 prices is equal to $1516 ÷ 1.27 = $1192.*

c. The GNP deflator is an average price index for the prices of all final goods and services. There are other price indexes which are frequently used which reflect the average prices for different groupings of commodities. The most frequently used indexes other than the GNP deflator are the consumer price index, for the prices of commodities which consumers buy, and the wholesale price index, for prices of intermediate goods purchased by producers.

Example: *Other price indexes which are frequently used are indexes of stock prices, e.g., the Dow-Jones index, the Standard and Poors index, and others. They show how the prices of shares of stock change from day to day.*

d. An increase in the average price level is called inflation; a decrease is called deflation. When there is inflation, nominal GNP is increasing faster than real GNP. Usually inflation is expressed as a rate of increase per year. That is, if the rate of inflation is 5 percent per year, the average price level is increasing at a rate such that if it continued to increase at that rate for one year the price level would increase by 5 percent in that time.

Example: *From information on prices and quantities of goods produced in any two years it is possible to compute nominal GNP, real GNP, the GNP inflator, and the rate of inflation between the two years. Consider the following data:*

	Year 1	Year 2
Bread (loaf)		
quantity	*150*	*100*
price	*$1.00*	*$2.00*
Apples (pound)		
quantity	*700*	*1000*
price	*$ .50*	*$ .40*

Nominal GNP is the market value (price times quantity) of all final goods and services produced using current prices in each year. Nominal GNP was $500 for year 1 and $600 for year 2. Real GNP in first-year prices is the market value of output produced using first-year prices to value the output in each year. By using the first year as the base year, real GNP in the first year must be the same as for money GNP, $500. For the second year, real GNP in first-year prices would be 100 x $1.00 plus 1000 x $0.50, or $600. The GNP deflator is the ratio of money GNP to real GNP in each year. In the first year this must be 1.00. For the second year, the ratio is also 1.00, which means there was no inflation between the first year and the second year.

1.3.3. Potential GNP

a. An economy's rate of output depends on the quantity of labor that is utilized and the productivity of labor. The more labor utilized, given its productivity, the higher will be GNP. The higher labor productivity, given the quantity utilized, the higher will be GNP.

Definition: Labor productivity -- the output per unit of labor input, usually output per man hour employed.

Example: GNP in the United States is greater than in the USSR, even though the U. S. has a somewhat smaller supply of labor, because the U. S. has much higher labor productivity.

b. The rate of output that would result if the economy's labor were "fully" utilized is called potential GNP. That is, an economy's GNP

will be equal to its potential when its labor resources are fully employed, i.e. full employment GNP. When there is high unemployment of labor, then actual GNP is less than its potential. The difference between actual and potential GNP is sometimes called the GNP gap.

Example: *For 1975, the estimates of real potential GNP (in 1958 prices) was approximately $930 billion, while real actual GNP (in 1958 prices) amounted to $810 billion. Consequently, for 1975 the GNP gap (in 1958 prices) was $120 billion.*

c. Increases in potential GNP occur if there is growth in the labor force or growth in labor productivity. Growth in the labor force can result from growth in population, changes in composition of population, and changes in the willingness of people to work. Growth in labor productivity can be the consequence of growth in the stock of capital goods per worker and technological progress.

Definition: Labor force -- the number of persons employed or unemployed but actively seeking employment.

Example: *Since 1929, the average rate of growth of the labor force has been approximately 1 1/4 percent per year, while the average rate of growth of labor productivity has been about 2 percent per year. This has resulted in an average rate of growth of potential GNP of approximately 3 1/4 percent per year.*

d. In the short run, i.e., in any current period, potential GNP can be regarded as having been already determined by past events. In the long run, when allowance is made for the passage of time and the accompanying technological progress and growth in the labor force and stock of capital goods, potential GNP can change. Since in the short run potential GNP is fixed, short run economic policy is primarily concerned with the gap between actual and potential GNP. Since in the long run, potential GNP can grow, long run economic policy is primarily concerned with whether population growth, investment and technological progress are occuring at optimal rates.

1.3.4. Unemployment

a. As was discussed above, whenever actual GNP falls short of potential there is above normal unemployment. By definition, there can be full employment of labor only when actual and potential GNP are equal. There have been many periods when actual GNP was substantially below potential with resulting high unemployment rates.

Example: *In the great depression unemployment reached as high as 25 percent of the labor force in 1933. In 1975, the unemployment was greater than 8 percent of the labor force for the first time since the end of the great depression in 1941.*

b. Full employment is not defined to be zero unemployment. Frequently, full employment is said to exist when the unemployment rate is 4 percent. At full employment there will normally be some frictional unemployment and structural unemployment. There is some disagreement as to which unemployment rate -- 3, 4, or 5 percent -- corresponds to full employment. The amount of frictional and structural unemploymen depends on demographic and other variables and may vary over time.

Definitions: Unemployment rate -- the percent of the labor force that is unemployed.

Frictional unemployment -- members of the labor force who are unemployed who are in the process of changing jobs, for whom job vacancies exist, and who are qualified to fill those vacancies.

Structural unemployment -- members of the labor force who are unemployed, for whom job vacancies exist, but who are unqualified to fill those vacancies.

Example: *During the 1960's, it was generally accepted that the full employment unemployment rate was 4 percent. During the 1970's, many economists believe that increases in frictional and structural unemployment have increased the full employment unemployment rate to 5 percent.*

c. Because accurate data on employment, unemployment and labor force are more easily collected, full employment is usually defined in terms of labor. It should be understood, however, that when there is high unemployment of labor there is also high unemployment of capital goods and land. But since employment of labor and other factors of production tend to fluctuate together, estimates of potential GNP and the GNP gap based on data on employment and unemployment of labor are reasonably accurate.

d. Just as it is possible to have the unemployment rate rise above its full employment level, it is also possible to reduce the unemployment rate below that level. For many years, 4 percent was taken to be the full employment unemployment rate. During that period the normal amount of frictional and structural unemployment was estimated to be 4 percent of the labor force. When the unemployment rate exceeded 4 percent the number of unemployed workers exceeded the number of vacancies. When the unemployment rate fell below 4 percent, the number of vacancies exceeded the number of unemployed workers.

1.4 Economic Policy

1.4.1. The role of government

a. We have seen already that the government is an active participant in the economy: it makes expenditure for goods and services, it collects taxes, it borrows money. The government can also influence economic events in other ways: it regulates industries, it passes laws affecting the terms on which transactions can take place, it can influence household and business attitudes by its pronouncements. All of these actions and others constitute economic policy. It is not a reasonable question to ask whether the government should have an economic policy. In carrying out its generally accepted constitutional role, the government will consciously or unconciously have an impact on the economy. The question relevant to the subject matter of this course is whether the government should take into account macroeconomic conditions and its impact on them in making its decisions.

Example: *In maintaining a military establishment -- presumably for reasons not directly related to macroeconomic*

conditions -- the U. S. government makes huge expenditures. How it finances that expenditure -- whether it be through taxes or borrowing -- may have a big impact on the unemployment rate, the rate of inflation and the rate of growth of GNP. There is no getting around the fact that this financing decision has to be made and how it is made may be of major economic importance.

b. It is generally agreed that the government should make economic policy in the public interest and that this requires being concerned about macroeconomic conditions. It is also generally presumed that, in the United States, the representative, democratic political system will make government adequately responsive to the wishes of the people and will bring about generally acceptable compromises between differing points of view. Whether this be true is not the subject matter of economics, although it should be recognized that there is a small but vocal group of economists who believe that the U.S. political system does not work effectively because of the nature of its economic system and that this should fall within the subject matter of economics. Be that as it may, this course will not focus on such issues.

Example: *Some radical economists believe that there is a relatively small segment of the economy that controls big business and that also, through its economic power, has disproportionate political influence. This is one reason why these economists argue for a peaceful socialist revolution.*

c. As the above suggests, it is a normal part of the political process for there to be debate and disagreement about what constitutes the right government economic policy. A substantial part of most discussion is concerned with differences of opinion about what the objectives or goals of any economic policy should be. But, another great source of disagreement is difference of opinion about what the effects of any particular policy action would be. It is important for anyone trying to understand public debate about economic policy to distinguish between disagreements about the objectives of policy and disagreement about the effects of policy.

Example: *The President may propose a budget which he claims should and will reduce both inflation and unemployment. The Senator criticizes the proposal because it will, he claims, reduce unemployment, but increase inflation. The Congressman supports the proposal for the same reason. In this case, both the Senator and the Congressman disagree with the President, but agree with each other, about what the effects of the proposed policy would be. However, the Senator and the Congressman disagree with each other, but not necessarily with the President, about what the goals of budget policy should be.*

1.4.2. Policy objectives

a. In thinking about economic policy it is useful to distinguish between instrument variables and target variables. Instrument variables are those which the government controls directly. Target variables are those which are of concern to the public and, therefore, to the government and the values of which depend on the values of instrument variables. Thus the government can affect the target variables through its control of the instrument variables.

Example: *To the extent that GNP can be affected by changes in some instrument variable and is of concern to the government, it is a target variable.*

If government expenditure has an effect on GNP, it is an instrument variable.

b. What the target variables should be and what values for them the government should seek is primarily a subjective matter and consequently is not the province of the professional economist. There is nothing about the training of an economist that makes him better qualified than any other citizen to decide what the goals of government policy should be. This is not to say that economists cannot usefully contribute to the process by which policy objectives are

formed. The economist may be helpful by spelling out for the public and the politician what the alternative target variables might be so that an informed choice can be made.

Example: *In some respects there seems to be broad agreement about the objectives of economic policy. Most people agree that lower unemployment and lower inflation are desirable. In fact these objectives have been written into law in the form of the Full Employment Act. In other areas there has been much disagreement. Whether the government should encourage a rapid growth of potential GNP is a matter of considerable controversy. Both of these issues will be discussed in detail later in the course.*

c. In formulating public policy it is not enough to have agreement, for example, that lower unemployment and lower inflation are desirable. It would also be necessary to have agreement on the relative importance of each. This is because it may not be possible to achieve both objectives simultaneously and a choice will have to be made as to which objective must be sacrificed

Example: *In some circumstances it may not be possible to reduce unemployment without increasing inflation, or vice versa. To make a decision it is necessary to have reached agreement about whether lower unemployment or lower inflation is more important.*

d. The existence of trade-offs among alternative policy objectives requires the body politic to be more precise in its formulation of goals than merely deciding that more of A, B, or C is desirable. It must also be prepared to say how desirable unit increases in A, B or C are relative to one another.

Definition: Trade-off -- there is a trade-off between two objects if it is impossible to obtain more of one object without giving up some of another.

Example: *If a final amount of money is to be spent on food and clothing, then the more food is bought, the less clothing it will be possible to buy. In this case, the buyer faces a trade-off between food and clothing.*

e. In order to make rational economic policy it is necessary for decision makers to formulate, at least implicitly, a social welfare function. That is, they must be able, in situations where multiple objectives involving trade-offs exist, to rank alternative possible outcomes of policy actions. Any consistent set of rankings can be represented by an explicit social welfare function.

Definition: Social welfare function -- an expression, possibly, in mathematical form, which indicates how the well being of society is influenced by the values of one or more target variables.

Example: *Suppose unemployment (u) and inflation* $\frac{\Delta P}{P}$ *are the only two target variables. One possible social welfare function might be:*

$$Welfare = -3U - 2\frac{\Delta P}{P}$$

For this example, each percentage point of unemployment rate subtracts 3 units from social welfare while each point of inflation rate subtracts 2 units. Both detract from social welfare but according to this social welfare function, an extra percentage point of unemployment rate is worse than an extra percentage point of inflation rate.

1.4.3. The role of the economist.

a. As indicated above it is not the economist's responsibility to tell society what is good for it. As individual citizens, of course, they are free to hold their own opinion as to what society's objectives should be, but they have no special competency or training which makes their opinions superior. It is the economist's role to try to learn enough about the way the economy functions to make it possible for the government to intelligently pursue politically determined goals.

That is, economists are qualified to make positive, but not normative, statements.

Definitions: Positive statement -- a statement about the state of the world which can in principle be refuted or verified by empirical evidence.
Normative statement -- a statement containing a value judgment as to what constitutes right and proper action.

Example: *The statement: "If the government increases taxes, then the rate of inflation will decrease" is a positive statement. The statement: "The government should increase taxes, so as to decrease the rate of inflation" is normative.*

b. In order to understand how the economy functions and to be able to predict the effects of instrument variables on target variables, economists must construct models of the economy which show how different variables are interrelated. This would involve (1) specifying a set of assumptions and deducing their implications, and (2) testing the model against data on economic behavior in the real world.

Example: *The model of market behavior discussed in section 1.1 involves the assumption that demand curves are negatively sloped and supply curves are positively sloped. From this it can be deduced that if there is a shift to the right in the supply curve, the price will fall. In principle, both the assumptions and the conclusions of the model can be tested with data from market behavior in the real world.*

c. It is frequently claimed that economists often disagree with one another about the way the economy works. Such disagreement does exist, although to a lesser extent than most laymen realize. Usually the disagreement stems from a difference in opinion about the validity of the assumptions incorporated in an economic model. Because sufficient data are not always available and what data that are available come from the real world rather than the controlled environment of a laboratory, it is

often difficult to make definitive empirical tests of economic models. It is one of the purposes of economic research to collect enough data and carry out empirical tests so that disputes about how the economy functions can be resolved.

Example: *Sometimes in markets it is observed that when the supply curve shifts to the right, the price increases, rather than falls as the model would predict. This could be interpreted to mean that the demand curve is upward sloping or the supply curve is downward sloping, contrary to the assumption of the model, or that the demand curve also shifted. In a laboratory experiment, if such were possible, the demand curve would have been "held" constant. In the absence of laboratory controls, it is necessary to collect data on all those variables which might cause the demand curve to shift, and thereby, take into account any such shifts when testing the model.*

d. In formulating its economic policy, the government is forced to take into account the possible consequences in relation to many objectives. In addition to unemployment and inflation, other target variables include the share of gross national expenditure made by the government, the size of the government deficit, the level of exports and imports relative to GNP and to each other, and the growth of potential GNP. One role of the economist is to urge decision makers to clarify their thinking about the relative importance of each objective and to judge a policy by its overall impact in terms of the policy-maker's social welfare function.

Example: *When any proposed policy action is discussed, it is likely that different politicians will emphasize different consequences of its implementation. Some may oppose it because of its effect on the budget deficit; others may support it because of its effect on unemployment, etc. Usually, such disagreement reflects*

differences in the social welfare function that participants in the debate want the government to adopt. The economist's contribution to the debate might be to make clear what effect the proposed action would have on all target variables and to urge all decision makers to take into account all of these effects in judging the merits of the case.

MACRO UNIT 2

A SIMPLE MODEL OF INCOME AND EXPENDITURE DETERMINATION

2.1 The Structure of the Model
2.2 Solving the Model
2.3 Interpreting the Model

LECTURE OUTLINE

2. A SIMPLE MODEL OF INCOME AND EXPENDITURE DETERMINATION

2.1. The Structure of the Model

2.1.1. General nature of the model

a. Ideally, economists want a model of income and expenditure which will explain the levels of and changes in key aggregate variables. For policy purposes, it is desirable to have a model that will predict the effects of changes in instrument variables on target variables. Such a model of aggregate income and expenditure would enable policy makers to formulate rational policy designed to control the level of GNP and other variables. It would also enable economists to forecast future levels of economic activity.

Definition: Model -- a theory which focuses on the main variables of interest and indicates their interrelationships to explain how or why real-world phenomena occur.

Example: *In explaining the withdrawal of his proposal to Congress for a $50 per person tax rebate early in 1977, President Carter argued that GNP would reach target level in the coming year without the rebate. Implicitly, President Carter, or his advisers, were using a model of some kind to form such a conclusion.*

b. In order for a model of income and expenditure to achieve these objectives, it must take account of the different flows of expenditure and income and their interrelationships. That is, it must explain what determines the levels of all the variables which make up the circular flow (see section 1.2.4.), namely:

gross national income
gross national expenditure
consumption expenditure
investment expenditure
government expenditure
net exports
retained business earnings
net taxes
disposable personal income

c. Typically, a model will treat some variables as endogenous and others as exogenous. The purpose of a model is to explain the behavior of the endogenous variables, given the values of the exogenous variables. In some cases, the treatment of some variables as exogenous seems entirely in accord with the way the world functions in the sense that those variables have an effect on, but are unaffected by, variables of interest to the economist. In other cases, for the sake of simplification, some variables are treated as exogenous when they are really endogenous Usually this is done for pedagogical purposes to focus on the interconnection of only a few variables to make clear the logical structure of certain aspects of a more complex and more realistic model.

Definitions: Endogenous variables -- those variables in a model the behavior of which the model is intended to explain and the values of which are determined within the model.
Exogenous variables -- those variables in a model which influence endogenous variables, but the values of which are determined outside the model.

Example: *In a model of the market for corn, the price and quantity of corn bought and sold are endogenous variables, and the factors influencing the positions of the supply curve (such as rainfall) and the demand curve (such as gross national income) are exogenous.*

d. A model consists of a set of structural relationships which describe how the variables in the model relate to each other. These relationships describe how the value of one endogenous variable depends on the values of other endogenous and/or exogenous variables. Some structural relationships are behavioral in that they describe the behavior of some agents in the economy with respect to the variables involved. Other structural relationships are identities in that they are true by definition.

Example: *If one were to model the market for gold, it might make sense to include the following structural relationships:*
(1) Demand curve of industrial users
(2) Demand curve of jewelers

(3) Demand curve of dentists

(4) Total demand equals sum of individual demands

(5) Supply curve of gold producers.

(1), (2), (3), and (5) are all behavioral relationships.

(4) is an identity.

e. In order for the model to be complete it must have as many structural relationships as it has endogenous variables. These structural relationships may be stated verbally, diagrammatically, or mathematically. However it is stated, the model must contain enough information to provide an explanation of the phenomena with which it is concerned.

Example: *In the simple supply and demand analysis of Section 1.1., a diagrammatic model was used. The endogenous variables (price and quantity) were equal in number to the structural relationships (supply curve and demand curve). Had the number of structural relationships been less than the number of endogenous variables -- e.g., if there had been only a supply curve -- the model would have been incapable of explaining how market price and quantity are determined.*

2.1.2. Simplifying assumptions

a. In analyzing the determination of national income and expenditure it is useful to begin with a highly simplified model. Even though such a model is too simple to be practically useful in the real world, it will help make clear the nature of macroeconomic models and it will also reveal some general principles which hold true in more complex and more realistic models.

Example: *Physicists analyze models of falling bodies in a vacuum even though they cannot create a perfect vacuum when they are interested in describing the behavior of falling bodies in air. They make the simplifying assumption that there is a vacuum for two reasons. First, it makes the analysis much simpler, thereby facilitating understanding of certain aspects of the problem. Second, under some circumstances the simple model gives a good approximation to reality.*

b. At this point the following three simplifying assumptions will be made:

(1) Government expenditure, net taxes and investment expenditure are exogenous variables. That is, none of these variables are influenced by any of the other variables in the model; they will be taken as given or determined by factors outside the model.

(2) Businesses pay out all of their after tax profits to their owners. That is, business retained earnings are equal to zero.

(3) There are no imports or exports. That is, all goods produced domestically are purchased domestically and all goods purchased domestically are produced domestically.

c. These simplifying assumptions partially satisfy the requirement that the components of expenditure and income encountered in the circular flow diagram be accounted for by the model. Government expenditure, net taxes, and investment expenditure are accounted for -- they are assumed to be exogenous. Retained business earnings and net exports are accounted for -- they are assumed to be equal to zero. What remains unaccounted for are consumption expenditure, disposable personal income, gross national expenditure, and gross national income. These must be accounted for by structural relationships.

2.1.3. The consumption function

a. In trying to identify the determinants of aggregate consumption expenditure, economists have hypothesized that disposable personal income is the single most important factor. Most people find this plausible from introspection regarding their own behavior: satisfaction is derived from consuming goods and services; the more goods and services consumed, the greater consumer satisfaction; the greater a household's disposable income, the more consumption expenditure it would be able and willing to make.

b. This hypothesis is also consistent with available evidence on the consumption behavior of individual households: on average, higher-income households spend more on consumption expenditure; and, as aggregate disposable income has increased so has aggregate consumption

expenditure. Therefore, one structural relationship in our simple model is that consumption expenditure depends on disposable personal income. Since this relationship describes the behavior of households, it is a behavioral relationship.

c. There are other variables in addition to disposable personal income which are important in determining consumption, such as wealth and the age distribution of the population. For example, given the disposable personal income of households, the higher their wealth -- i.e., the higher their cumulated past saving in the form of bank accounts, real estate, stocks and bonds, etc. -- the higher consumption expenditure is likely to be. This dependence of consumption expenditure upon wealth could be included in the structural relationship But for the sake of simplicity, it will be assumed that consumption expenditure depends only on disposable personal income.

d. The relationship between consumption expenditure and national income is frequently referred to as the consumption function. In other words, consumption expenditure is a function of disposable income. It is ordinarily hypothesized that (1) the marginal propensity to consume is a constant that is greater than zero and less than one, and (2) the level of consumption expenditure that would result if national income were zero is greater than zero. (This consumption might be financed, for example, by drawing down on past saving.)

Definition: Marginal propensity to consume (MPC) -- the change in consumption expenditure resulting from a change in disposable personal income. In symbols, using Δ to mean "change in", C to mean consumption expenditure, and Y_d to mean disposable personal income,

$$MPC = \frac{\Delta C}{\Delta Y_d}.$$

The symbol b will be used to represent the marginal propensity to consume, and a will be used to represent the amount of consumption spending when $Y_d = 0$. The consumption function can then be expressed algebraically as

$$C = a + bY_d.$$

e. The consumption function can also be readily expressed in diagrammatic terms. In Figure 2.1 disposable personal income is measured along the

horizontal axis and consumption expenditure is measured along the vertical axis.

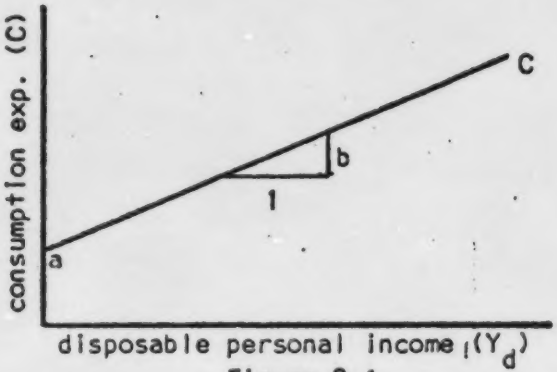


Figure 2.1

The consumption function is represented by the straight line. It shows for every value of disposable personal income the amount of consumption expenditure predicted by the consumption function. The vertical intercept (a) shows the consumption expenditure that would result if disposable personal income were zero. The slope of the line (b) is the marginal propensity to consume.

f. The hypotheses about consumption expenditure behavior incorporated in the discussion of the consumption function are broadly consistent with evidence on the national economy. The marginal propensity to consume does appear to be less than 1 and, although we have never observed the economy at a zero level of disposable personal income, observed consumption behavior is consistent with a consumption function that predict positive consumption at very low levels of income. It should be understood, however, that economists do not expect such a simple set of hypotheses to predict actual events perfectly. At best the consumption function can only approximate the real world and any prediction based on it will be subject to a margin of error.

2.1.4. Identities

a. In this very simple model of national income and expenditure the remaining structural relationships are identities -- i.e., relationships which hold true by definition. These, together with the consumption function and the treatment of some variables as exogenous, are sufficient to yield an explanation for all of the variables involved in the circular flow of income and expenditure.

b. One of these identities is the accounting definition of disposable personal income. Since one of the simplifying assumptions is that retained business earnings equal zero, this identity is simply that disposable personal income equals gross national income minus net taxes

c. Another accounting identity is the definition of gross national expenditure. Since net exports equal zero by assumption, gross national expenditure equals the sum of consumption, investment and government expenditure. This identity simply states that total expenditure is equal to the sum of its components.

d. The last accounting identity which completes the model is that gross national income equals gross national expenditure.

e. It is now possible to see how the model accounts for all of the variables which enter into the circular flow.

Investment expenditure	--	exogenous
Government expenditure	--	exogenous
Net exports	--	assumed to be zero
Net taxes	--	exogenous
Retained business earnings	--	assumed to be zero
Consumption expenditure	--	a function of disposable personal income
Disposable personal income	--	gross national income minus net taxes
Gross national expenditure	--	the sum of consumption, investment, and government expenditure
Gross national income	--	equals gross national expenditure

2.2. Solving the Model

2.2.1. Algebraic representation

a. The clearest and simplest way to state and analyze the model is in algebraic terms. Because it is convenient to do so, symbols are used to represent variables and parameters. In the following, capital letters will be used to represent variables and lower case letters parameters. A variable which is exogenous to the model will include a bar over its symbol, e.g., $\bar{I}$, exogenous investment expenditure.

Definition: Parameter -- a factor or term in a model the value of which is constant in the sense that it does not depend on the values of the endogenous or exogenous variables in the model.

Example: *In the equation for the relationship between the circumference and diameter of a circle -- $C = \pi D$ -- C and D are variables and π is a parameter.*

b. Using C to denote consumption expenditure and Y_d to denote disposable personal income, the consumption function can be expressed in terms of the following equation:

$$(1) \quad C = a + bY_d,$$

where a and b are parameters. The parameter a is the consumption expenditure that would be made if disposable personal income were zero, and b is the marginal propensity to consume. In terms of Figure 2.2. which diagrams the consumption function, a corresponds to the vertical intercept and b corresponds to the slope of the C line.

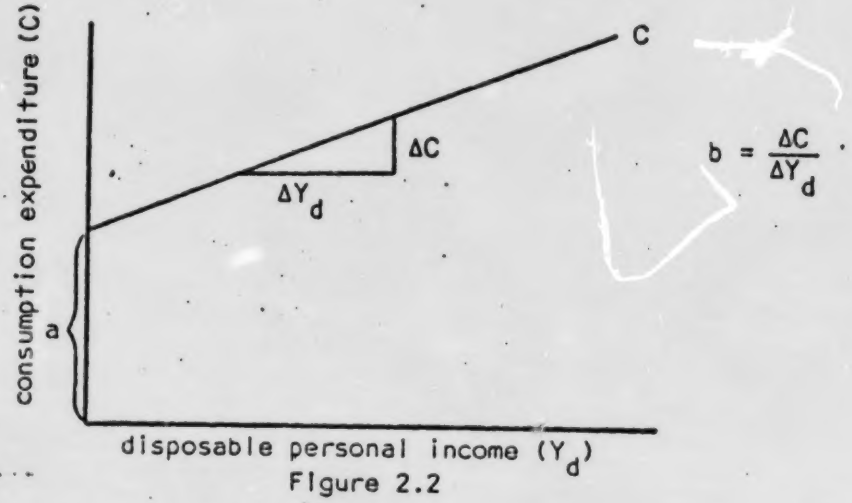


Figure 2.2

Example: *Suppose a = 100 and b = .8. Then the consumption function would be*

$$C = 100 + .8\ Y_d.$$

If Y_d were 1000, then C would be 900.

c. Using the following additional notation,

Y = gross national income,
E = gross national expenditure
I = investment expenditure
G = government expenditure
T = net taxes

the three identities in the model can be expressed simply as follows:

(2) $Y_d = Y - \overline{T}$

(3) $E = C + \overline{I} + \overline{G}$

(4) $Y = E$

d. The complete model then consists of equations (1) - (4) as follows:

(1) $C = a + bY_d$ parameters: a, b

(2) $Y_d = Y - \overline{T}$ endogenous variables: C, E, Y, Y_d

(3) $E = C + \overline{I} + \overline{G}$ exogenous variables: $\overline{T}$, $\overline{I}$, $\overline{G}$

(4) $Y = E$

Since it is composed of structural relationships, it is called the structural form of the model.

2.2.2. Diagramatic representation

a. The entire model can be represented diagrammatically on a graph in which expenditure is measured along the vertical axis and income is measured along the horizontal axis. Previously, the consumption function was shown on a graph which measured C on the vertical axis and Y_d on the horizontal axis. Since the model will be used primarily to explain the determination of Y, rather than Y_d, it is useful to derive the relationship between C and Y implied by the model. By combining the consumption function and the definition for disposable income -- equations (1) and (2) -- it is possible to obtain the relationship between C and Y implied by those two relationships. Substituting the expression for Y_d from equation (2) for Y_d in equation (1), yields the following:

$$C = a - b\overline{T} + bY$$

This relationship is shown in Figure 2.3 below. It has a vertical intercept $(a - b\overline{T})$ where $a - b\overline{T}$ is constant, and a slope b.

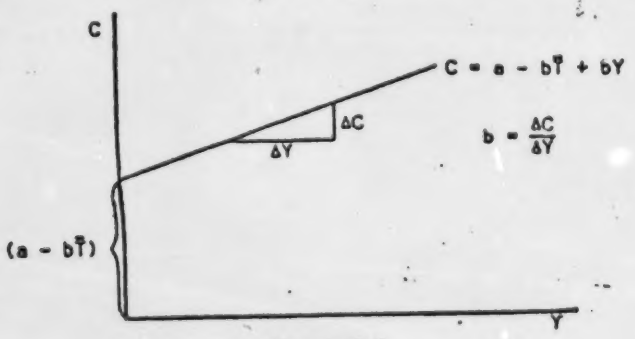


Figure 2.3

b. By adding to Figure 2.3 the information contained in equation (3), it is possible to obtain a relationship between E and Y that takes into account all of the information contained in equations (1), (2), and (3) This can be achieved by substituting the expression for C derived from equations (1) and (2) for C in equation (3) which yields:

$$E = a - b\bar{T} + \bar{I} + \bar{G} + bY .$$

This is shown in Figure 2.4 as line E. The first four terms in the equation -- $a - b\bar{T} + \bar{I} + \bar{G}$ -- determine the vertical intercept. The marginal propensity to consume -- the parameter b -- determines the slope. A comparison of the equation for line E with the equation for line C makes clear that line E has the same slope as line C, but an intercept that is higher by the amount $\bar{I} + \bar{G}$. That is, line E can be obtained by shifting up the C line by the amount $\bar{I} + \bar{G}$.

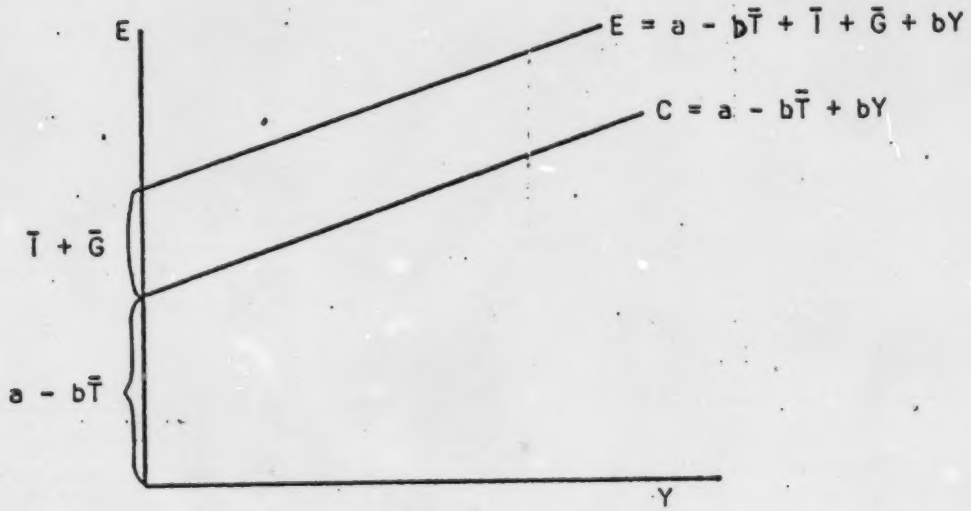


Figure 2.4

c. The line E in Figure 2.4 shows the total expenditure that households, businesses, and government would like to make for different levels of gross national income. This relationship follows from equations (1) - (3) of the model. In words, the derivation of this relationship can be stated as follows: given the assumptions that G and I are exogenous, E will change as C changes. Given that T is exogenous, Y_d will increase as Y increases. Since C depends on y_d, C will increase as Y increases. Therefore, since E will change as C changes, E will increase as Y increases.

d. Line E shows the relationship between E and Y implied by equations (1) - (3). Equation (4) is another relationship between E and Y that can be represented on the same graph. Equation (4) says that E equals Y, which is represented by the 45° line in Figure 2.5. Together, the two lines in Figure 2.5 contain all of the information about the interrelationship between E and Y contained in the model.

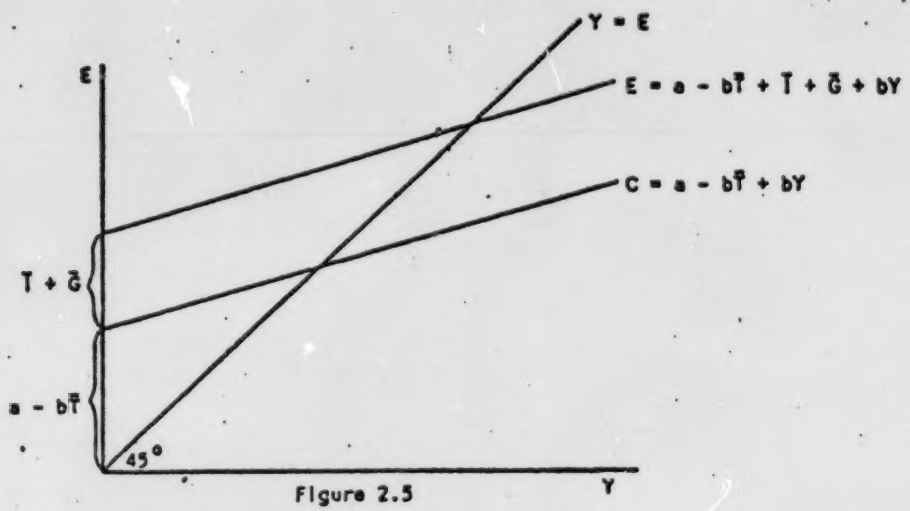


Figure 2.5

2.2.3. Solving the model diagrammatically

a. The principal objective in constructing the model is to find the values of the endogenous variables which will obtain in the economy. If the model is an approximately accurate (though a simplified) characterization of the economy, then the solution to the model will provide good estimates of these values. If the model is complete and logically consistent, it will contain enough information to yield a solution.

Definition: Solution -- the solution to a model is a set of values for the endogenous variables for which all the relationships making up the model hold true.

b. In order to obtain a diagrammatic representation of the model, the four structural relationships involving the four endogenous variables were combined to yield two relationships involving E and Y. These were shown as two lines on a graph which measured E on the vertical axis and Y on the horizontal axis. In order to find the values for E and Y for which all four structural equations hold true, it is necessary

to find the combination of E and Y which lies on both lines in the graph. This is given by the intersection of the two lines.

Example: *The diagrammatic method of finding a solution to a model was used in analyzing the model of a market. The supply and demand curves were the two structural relationships involving the two endogenous variables -- price and quantity. The solution was found by locating the intersection of the two curves.*

c. The solution to the simple model of gross national income and expenditure is depicted in Figure 2.6. The solution values are denoted by an asterisk. Any combination of values for E and Y other than E* and Y* cannot be solution values, because no other combination lies on both curves simultaneously.

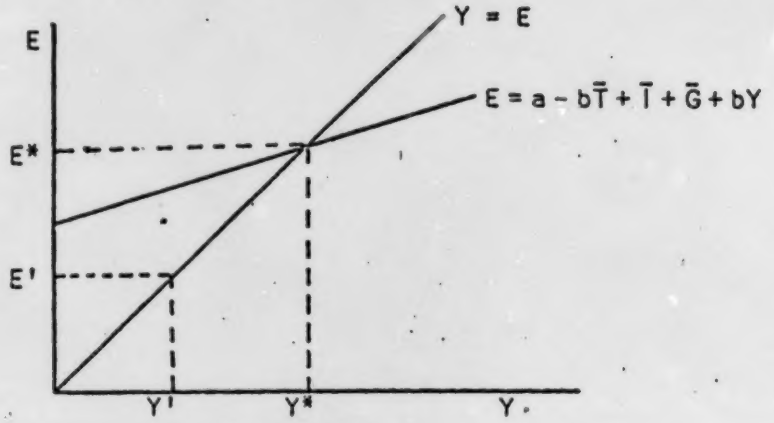


Figure 2.6

Example: *The combination E', Y' in Figure 2.6 is not a solution. While it constitutes a point on the E = Y line, it is not a point on the other line relating E and Y.*

d. By knowing how to find the solution to the model diagrammatically it is possible to see how a change in the value of any exogenous variable will affect the solution to the model. An increase in $\bar{I}$ or $\bar{G}$, or a decrease in $\bar{T}$, will have the effect of shifting up the $E = a + \bar{I} + \bar{G} - b\bar{T} + bY$ line. As can be seen in Figure 2.7, this has the effect of increasing the solution values of E and Y. The increase in E* and Y* is greater than the upward shift in the $E = a + \bar{I} + \bar{G} - b\bar{T} + b$ line. This will be discussed more fully later.

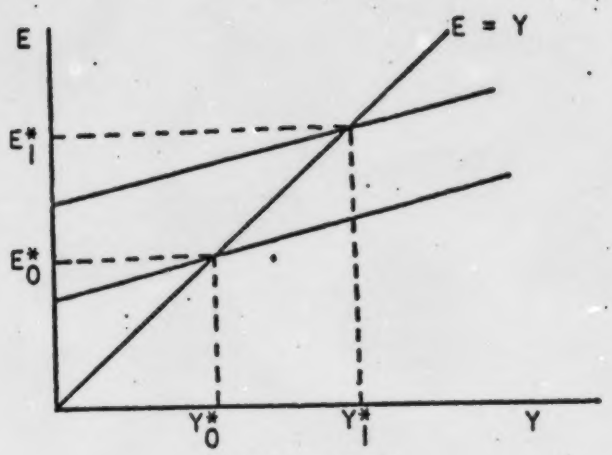


Figure 2.7

2.2.4. Solving the model algebraically

a. The solution to the model can also be found using algebraic methods. For some purposes the algebraic approach is superior since it makes it easier to obtain a precise quantitative result. The only technique in this approach which causes some students difficulty is solving a system of simultaneous equations. This can be done quite simply by substituting the expression for an endogenous variable in one equation for that endogenous variable in another equation in the models being considered here.

Example: *Consider the following system of equations involving the variables X and Y.*

$$(1) \qquad Y = 12 + 5X$$

$$(2) \qquad X = -6 + 2Y$$

By substituting the expression for X from equation (2) for X in equation (1) it is possible to find the solution value for Y, as follows:

$$Y = 12 + 5(-6 + 2Y)$$

$$Y = 12 - 30 + 10Y$$

$$9Y = 18$$

$$Y = 2$$

The same procedure can be used to find the solution value for X.

$$(2) \qquad X$$

b. This method can be applied to the structural form of the income-expenditure model:

$$\left.\begin{array}{ll} (1) & C = a + bY_d \\ (2) & Y_d = Y - T \\ (3) & E = C + \bar{I} + \bar{G} \\ (4) & Y = E \end{array}\right\} \quad \text{structural form}$$

Substituting Y_d from equation (2) for Y_d in equation (1) yields:

$$C = a - b\bar{T} + bY$$

Substituting this expression for C in equation (3) yields:

$$C = a - b\bar{T} + \bar{I} + \bar{G} + bY$$

(It should be recalled that both of the above substitutions were previously made in the process of constructing the C and E lines in the diagrammatic approach. See Section 2.2.2.)

Now substituting this expression for E into equation (4) yields a solution value for Y:

$$Y = a - b\bar{T} + \bar{I} + \bar{G} + bY$$

$$Y - bY = a - b\bar{T} + \bar{I} + \bar{G}$$

$$(5) \quad Y^* = \frac{1}{1-b}(a - b\bar{T} + \bar{I} + \bar{G})$$

This last step is equivalent to drawing the E line and the Y = E line on the same diagram and finding the intersection.

c. Y^* in equation (5) is expressed as a function only of exogenous variables and parameters, the values of which are assumed to be known. Equation (5) is a reduced form equation. Unlike any of the structural equations, it involves only one endogenous variable and, consequently, provides by itself a solution value for that endogenous variable.

Definition: Reduced form equation -- an equation derived from the structural form of a model, which expresses an endogenous variable in terms of known exogenous variables and parameters.

d. The reduced form equations for the other endogenous variables can be readily derived as well. Taken together they constitute the reduced

form of the model. The reduced form of the model gives solution value of all the endogenous variables in terms of the exogenous variables an parameters. From the reduced form it is possible to see directly how each of the exogenous variables influences the solution values of the endogenous variables.

Example: *Suppose the marginal propensity to consume (b) is 3/4. Then* $\frac{1}{1-b} = 4$ *and* $\frac{b}{1-b} = 3$. *In this case, if* $a = 100$, *then the reduced form equation for* Y^* *is*

$$Y^* = 400 - 3\overline{T} + 4\overline{I} + 4\overline{G}$$

If $\overline{T} = 200$, $\overline{I} = 150$ *and* $\overline{G} = 250$, *then*

$$Y^* = 400 - 600 + 600 + 1000 = 1400$$

2.3. Interpreting the Model

2.3.1. The concept of equilibrium.

a. In the preceding section it was shown how the structural form of the model can be used -- both diagrammatically and algebraically -- to find solution values for the endogenous variables. These solution values correspond to what economists call an equilibrium If the economy were in equilibrium, then there would be no tendency for any of the endogenous variables to change unless there was a change in one or more exogenous variables.

Definition: Equilibrium -- a situation in which there is no tendency for the endogenous variables involved to change in the absence of any change in the exogenous variables.

Example: *In the market model, the solution values for p and q define an equilibrium. If* p^* *and* q^* *prevailed in the economy there would be no tendency for p and q to change unless a change in an exogenous variable caused the demand and/or supply curves to shift.*

b. When the economy is in disequilibrium there is a tendency for the endogenous variables to change. This is because one or more of the structural relationships which make up the model of the economy do not hold true, which means that some agents in the economy will adjust their behavior.

Example: *In the market model a disequilibrium exists when, for the existing price, the quantities supplied and demanded are unequal. When there is excess demand, buyers bid up the price. When there is excess supply, sellers reduce the price.*

c. The models used in this course define an equilibrium. In order for suc models to be useful, it is essential that there is a tendency for the economy, when it is out of equilibrium, to converge toward the equilibrium defined by the model. If this is the case then the equilibrium is a stable equilibrium.

Definition: Stable equilibrium -- an equilibrium position toward which the economy will move from disequilibrium positions

Example: *The market model defines a stable equilibrium if, when the price is above the equilibrium price, it tends to fall, and vice versa.*

d. In order for the equilibrium in the income-expenditure model to be stable, it is necessary that if E and Y are below their equilibrium levels, they will increase; when they are above their equilibrium levels, they will decrease. If this were not true, the model would not be very helpful in understanding the behavior of the economy since there would be no tendency for the levels of GNP in the economy to converge to the equilibrium levels of gross national income and expenditure explained by the model.

e. If the model defines a stable equilibrium, this does not mean that there will be no changes in the endogenous variables. Even for such a model there would be changes in the endogenous variables due to changes in the exogenous variables. When there are changes in the exogenous variables, the endogenous variables will converge toward their equilibrium values.

2.3.2. The economy in disequilibrium

a. In order to determine whether the equilibrium described by the income-expenditure model is stable, it is necessary to understand what is

happening in the economy when it is out of equilibrium. This can be done most easily in terms of the diagrammatic representation of the model in which there are two curves as in Figure 2.8. The curve which corresponds to the equation $E = a - b\bar{T} + \bar{I} + \bar{G} = bY$ can be interpreted as showing the desired gross national expenditure that would result for any given level of gross national income. The Y = E curve shows the actual level of E that would result for any given level of Y.

Definition: Desired gross national expenditure -- that level of expenditure which households, businesses, and government would like to make given the level of gross national income.

Actual gross national expenditure -- that level of expenditure which households, businesses, and government would be recorded as making in the national income and expenditure accounts.

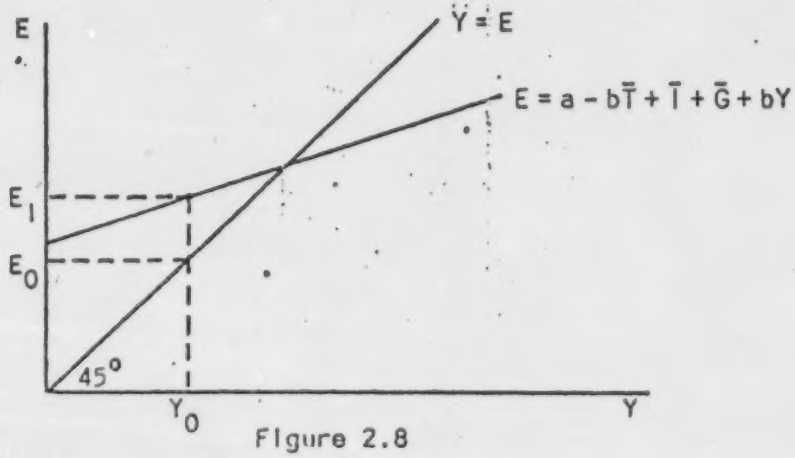


Figure 2.8

b. As Figure 2.8 indicates, actual and desired expenditure will not be equal when the economy is out of equilibrium. Since the Y = E relationship holds true by definition, it must therefore be true that when the economy is out of equilibrium, the economy is not on the $E = a - b\bar{T} + \bar{I} + \bar{G} + bY$ curve. Actual expenditure will thus be different from desired expenditure when the economy is out of equilibrium. C will be less than $a - b\bar{T} + bY$, I will be less than $\bar{I}$, and/or G will be less than $\bar{G}$.

Example: *In Figure 2.8, at Y_0, E_0 (actual E) is less than E_1 (desired E).*

c. Below equilibrium, actual expenditure is less than desired. In this situation, households, businesses, and/or government must be purchasing less than they like. This could take the form of unfilled orders. This provides a motive for producers to hire more factors of production and produce more output, both to meet the unfilled orders and to avoid there being new orders which go unfilled. The increase in production will result in an increase in income and actual expenditure which is a move toward equilibrium.

Definition: Unfilled orders -- desired consumption, investment or government expenditures which are not made because the commodities are unavailable.

Example: *Suppose the economy were initially at an equilibrium, but an increase in $\bar{I}$ caused Y^A to increase. Businesses might try to make purchases for new capital goods at the new higher level, but if producers did not respond immediately by expanding output, their orders for these goods would not be filled completely. The existence of these unfilled orders, however, would provide an incentive to producers to expand production.*

d. When Y is less than Y* the disequilibrium can also show up in the form of undesired inventory disinvestment. Producers normally hold inventories of the goods they produce to meet unexpected increases in demand for their product. When demand is higher than expected then the stock of inventories is reduced. Just as the increase in the stock of inventories is a form of business investment expenditure, so is a decrease in inventories a form of disinvestment. Since a decrease in inventories due to an unexpected increase in demand is unplanned or unintended, it is termed undesired inventory disinvestment. The reduction of inventories below normal levels provides producers with an incentive to increase output to replenish their stocks of inventories and to prevent further declines.

Definition: Undesired inventory disinvestment -- the completion of sales by a reduction of producers' stocks of inventories of final goods below normal levels.

Example: *In a situation where Y is less than Y* it might occur that household demand for automobiles exceeds the current level of production. If there were no inventories this would lead to unfilled orders, as sometimes occurs. If producers have stocks of automobiles in inventory, they may satisfy that excess demand by reducing their stock of inventories. This would be undesired inventory disinvestment.*

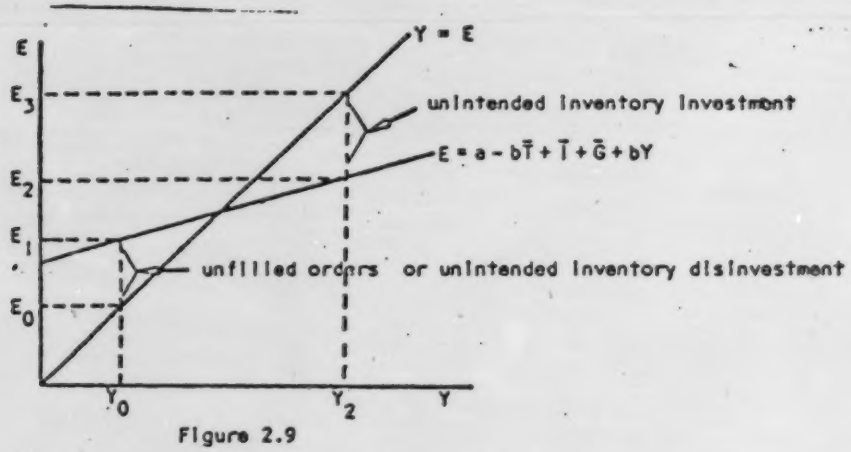


Figure 2.9

e. Above equilibrium, actual expenditure exceeds desired expenditure. In this situation production exceeds the amount that households, businesses and government want to buy. The difference takes the form of undesired or unintended inventory investment, i.e., actual I is greater than the desired amount of $\bar{I}$. (See Figure 2.9.) That is, producers find they cannot sell all they produce and their stocks of inventories of final goods increase above normal levels. In this situation there is a motive to reduce production, which would result in a movement in E and Y toward equilibrium.

f. Since there is a tendency to move toward equilibrium whenever the economy is out of equilibrium, it can be expected that the equilibrium described by the income-expenditure model is stable.

2.3.3. Changes in equilibrium.

a. It will be presumed throughout that the economy moves fairly rapidly to its equilibrium position. Observed changes in the economy can then

be interpreted as changes resulting from changes in the equilibrium position, rather than changes from disequilibrium to a fixed equilibrium position. Changes in the equilibrium can occur only if there are changes in the exogenous variables or in the parameters of the model. This can be seen most clearly in terms of the reduced form of the algebraic representation of the model.

b. Consider the reduced form equation for Y:

$$(5) \quad Y^* = \frac{1}{1-b}(a - b\bar{T} + \bar{I} + \bar{G})$$

In this equation Y^* depends only on exogenous variables and parameters. If none of these change, then Y^* will not change. By rewriting (5) as

$$Y^* = \frac{a}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G},$$

it is possible to see how a change in any one of the exogenous variables, given the values of a and b, will affect Y^*. Let the subscripts 0 and 1 be used to denote the levels of the variables before and after a change. Then Y^*_1 and Y^*_0 will be determined as follows:

$$Y^*_1 = \frac{a}{1-b} - \frac{b}{1-b}\bar{T}_1 + \frac{1}{1-b}\bar{I}_1 + \frac{1}{1-b}\bar{G}_1$$

$$Y^*_0 = \frac{a}{1-b} - \frac{b}{1-b}\bar{T}_0 + \frac{1}{1-b}\bar{I}_0 + \frac{1}{1-b}\bar{I}_0$$

Subtracting the second equation from the first gives:

$$Y^*_1 - Y^*_0 = -\frac{b}{1-b}(\bar{T}_1 - \bar{T}_0) + \frac{1}{1-b}(\bar{I}_1 - \bar{I}_0) + \frac{1}{1-b}(\bar{G}_1 - \bar{G}_0).$$

That is, the change in Y^* depends only on the parameters and the changes in exogenous variables. Using Δ to indicate "change in", it is possible to write the relationship as

$$\Delta Y^* = -\frac{b}{1-b}\Delta\bar{T} + \frac{1}{1-b}\Delta\bar{I} + \frac{1}{1-b}\Delta\bar{G}$$

which shows precisely the effect on Y^* that a change in any of the exogenous variables will have. If either $\bar{I}$ or $\bar{G}$ increases, ceteris paribus, Y^* will increase by $\frac{1}{1-b}$ times the change in $\bar{G}$ or $\bar{I}$. If $\bar{T}$ increases, ceteris paribus, Y^* will decrease by $\frac{b}{1-b}$ times the change in $\bar{T}$.

Definition: Ceteris paribus -- other relevant factors (in this case, parameters and other exogenous variables) remaining constant.

Example: *If* $B = .75$, *then* $\frac{b}{1-b} = 3$ *and* $\frac{1}{1-b} = 4$. *Consequently*

$$\Delta Y^* = -3\Delta\bar{T} + 4\Delta\bar{I} + 4\Delta\bar{G}.$$

If $\bar{G}$ *were to increase by 10,* ceteris paribus, *then* Y^* *would increase by* 4×10, *or 40. If* $\bar{G}$ *were to increase by 10 and* $\bar{I}$ *were to decrease by 10,* ceteris paribus, *then* Y^* *would remain unchanged.*

c. The coefficients of the exogenous variables in the reduced form equations depend on the parameters of the model. They will not generally be equal to one, which means, for example, that an increase in $\bar{I}$, ceteris paribus, will result in an increase in Y^* of a different amount If one were to look only at part of the structural model, a different conclusion might be reached. Equations (3) and (4),

(3) $E = C + \bar{I} + \bar{G}$
(4) $Y = E$,

taken by themselves might lead one to think that an increase in $\bar{I}$ would lead to an equal increase in Y^*. The reduced form equation, however, takes into account additional information contained in equations (1) and (2) and shows the full effect of a change in any of the exogenous variables.

d. Equations (3) and (4) by themselves give an incomplete account of the effects of a change in $\bar{I}$ (or $\bar{G}$ or $\bar{T}$). They ignore the effect that an increase in $\bar{I}$ will have on C, which is why equations (1) and (2) need to be included in the analysis:

(1) $C = a + bY_d$
(2) $Y_d = Y - T$.

An increase in $\bar{I}$ will increase E and Y as equations (3) and (4) make clear. But the increase in Y will increase Y_d and, therefore, C as equations (1) and (2) show. This in turn will cause a further increase in E and Y. The lesson is that to identify the effect of a change in an exogenous variable, it is necessary to take into account all of the simultaneous interrelationships among the endogenous variables in the model. The reduced form equations do just that.

2.3.4. Multipliers

a. In the preceding sections it was shown that a change in an exogenous variable, ceteris paribus, will result in a change in the equilibrium value of the endogenous variable. This change will be equal to the change in the exogenous variable times a multiplier. The coefficients of exogenous variables in reduced form equations are multipliers.

Definition: Multiplier -- the increase in the equilibrium value of an endogenous variable that will result from a unit change in an exogenous variable.

Example: *In the reduced form equation for Y,*

$$Y^* = \frac{a}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G},$$

the coefficient of $\bar{I}$, $\frac{1}{1-b}$, *is the investment multiplier for gross national income. This means, ceteris paribus, that*

$$\Delta Y^* = \frac{1}{1-b}\Delta\bar{I}.$$

b. The values of the investment and government expenditure multipliers for gross national income depend on the value of b, the marginal propensity to consume. The higher b is, the higher the value of the multiplier are. This makes sense because the multiplier takes into account the effect on C that results from changes in Y brought about by changes in the exogenous variables. The higher b is, the larger the effect on C. Put another way, the change in Y* consists of two components:

(1) the autonomous change in $\bar{I}$ or $\bar{G}$;
(2) the induced change in C.

Definitions: Autonomous change -- a change due to some cause outside of the model.
Induced change -- a change caused by some determining factor within the model.

Example: *The government's increase in G to fight the Vietnam War was an autonomous change. The resulting increases in Y and C which resulted from the increase in G was an induced change.*

c. The induced change in C which results from an autonomous change in $\bar{I}$ or $\bar{G}$ is higher when b is higher. Consequently, the size of the investment or government expenditure multiplier is higher when b is higher.

Example: *The value of the investment and government expenditure multiplier for Y is* $\frac{1}{1-b}$. *If* $b = .6$, $\frac{1}{1-b} = 2.5$. *If* $b = .8$, $\frac{1}{1-b} = 5$.

d. The net tax multiplier equals $-\frac{b}{1-b}$. It is negative because the effect of increasing net taxes is to reduce disposable personal income and, therefore, consumption expenditure. The change in Y* due to a change in $\bar{T}$ also consists of two components:

(1) The initial induced change in C caused by the autonomous change in $\bar{T}$;

(2) the induced change in C caused by the induced change in Y.

Like the $\bar{I}$ and $\bar{G}$ multipliers, the $\bar{T}$ multiplier is larger in absolute value when b is larger, since both components depend on b.

Example: *The net tax multiplier for Y is* $-\frac{b}{1-b}$. *If* $b = .6$, $-\frac{b}{1-b} = -1.5$. *If* $b = .8$, $-\frac{b}{1-b} = -4$.

e. The $\bar{I}$, $\bar{G}$, and $\bar{T}$ multipliers can be seen in terms of Figure 2.10. The effect of a change in $\bar{I}$, $\bar{G}$, or $\bar{T}$ is to shift the $E = a - b\bar{T} + \bar{I} + \bar{G} + bY$ line. An increase in $\bar{I}$ or $\bar{G}$ would shift the line up by that amount. A decrease in $\bar{T}$ would shift the line up by b times that amount. As a result of such a shift, the initial equilibrium (E_0^*, Y_0^*) would no longer be an equilibrium because desired expenditure would exceed actual by the amount of shift in the desired expenditure line. If E and Y were to increase by that amount from their initial equilibrium values (E_0^*, Y_0^*) to (E_1, Y_1), the new position would not be an equilibrium because actual expenditure E_1 would be less than desired expenditure by the amount of the increase in C induced by the increase in Y from Y_0^* to Y_1. If E and Y were to increase to (E_2, Y_2) to take into account that induced increase in C, the new position would still not be an equilibrium because the desired expenditure would exceed actual expenditure by the amount of the increase in C induced by the increase in Y

from Y_1 to Y_2. Only if Y increases to Y_1^* will the economy reach an equilibrium. The increase in E and Y from (E_0^*, Y_0^*) to (E_1^*, Y_1^*) will equal the sum of the autonomous and induced changes in expenditure

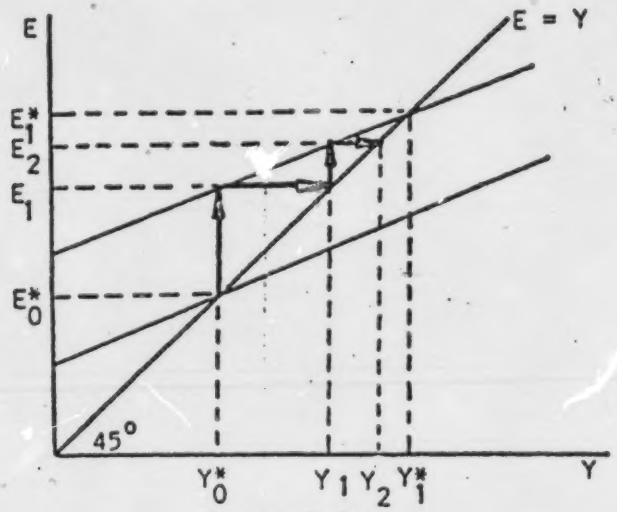


Figure 2.10

Example: *Suppose b = .5 and there is an increase in $\bar{I}$ of 10. It would be possible to calculate the change in equilibrium E and Y by adding up the changes in E and Y due to the change in expenditure and the sequence of induced changes in consumption as follows:*

Changes in Components of Spending	*Resulting Change In Y*
1. *Autonomous change in $\bar{I}$ of 10.00*	*Y increases by 10.00*
2. *Consumption increases by 5.00 because of the preceding 10.00 increase in Y*	*Y increases by 5.00*
3. *Consumption increases by 2.50 because of the preceding 5.00 increase in Y*	*Y increases by 2.50*
4. *Consumption increases by 1.25 because of the preceding 2.50 increase in Y*	*Y increases by 1.25*
.	.
total change	*20.00*

f. As indicated in Section 2.3.3., it will be presumed in this course, unless otherwise stated, that the economy is in equilibrium all the time. That is, it is assumed that the economy adjusts instantaneously in response to changes in exogenous variables. Put in different words, it is assumed that the multiplier process is worked through

very quickly. In terms of Figure 2.11, if there is an autonomous change in expenditure from time period 0 to time period 1 which causes the E curve to shift from E_0 to E_1, it is assumed here that actual Y will increase from Y_0^* in period 0 to Y_1^* in period 1.

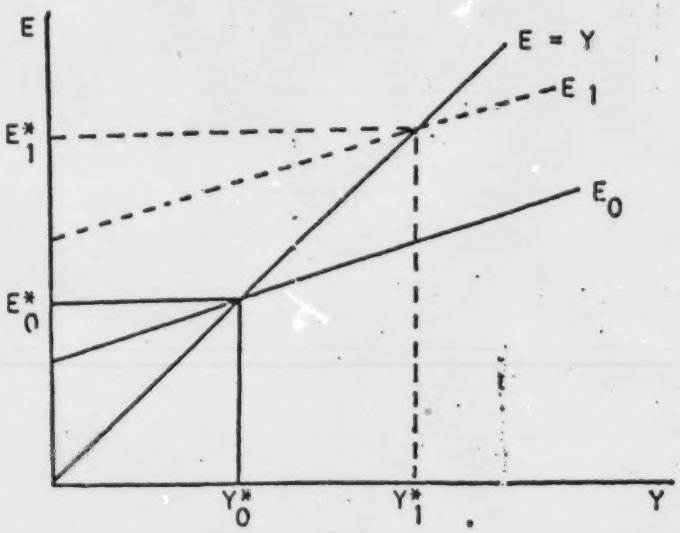


Figure 2.11

g. In the real world, however, the multiplier process is not completed instantaneously. That is, when there is an autonomous change in some component of expenditure, the economy does not jump immediately, but converges over time, to the new equilibrium. During this period of convergence, of course, the economy will be in a state of disequilibrium. This can be seen in terms of Figure 2.12a and 2.12b in which a possible response of the economy to an autonomous increase in $\bar{I}$ is depicted.

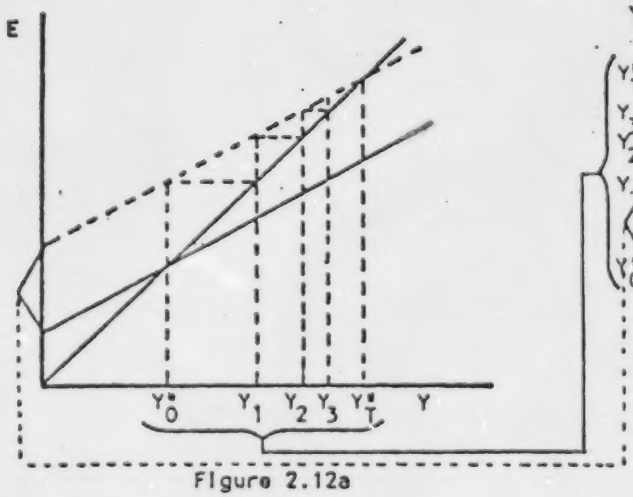


Figure 2.12a

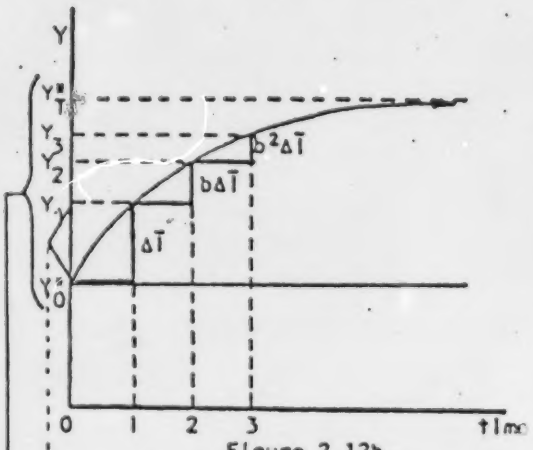


Figure 2.12b

The economy is assumed to be initially in equilibrium in period 0 at Y_0^*. One period later (this could be a week, a month, or longer, depending on how quickly the economy adjusts) it is assumed that $\bar{I}$ increases by $\Delta\bar{I}$. In period 1, actually Y increases by the amount of the autonomous increase in $\bar{I}$ to a level Y_1, but is not in equilibrium in period 2, Y increases further by the amount $b\Delta\bar{I}$ to a level Y_2, but is still not in equilibrium. This second period increase results from the induced increase in C resulting from the increase in Y in period 1. In period 3, Y increase by $b^2\Delta\bar{I}$, which is the induced increase in C due to the previous period's increase in Y. Eventually Y will converge to Y_T^* which is the new equilibrium.

h. The time path of the economy described above is only one possible response to an autonomous change in expenditure, but it is a reasonable one. If the time periods are fairly short in which each successive round of adjustment occurs, then the assumption made here that the economy is always in equilibrium is quite a reasonable approximation to reality. However, the possibility of a longer lag in the response of the economy should be kept in mind when applying the income-expenditure model to the real world.

MACRO UNIT 3

AGGREGATE DEMAND, UNEMPLOYMENT, AND INFLATION

3.1 Aggregate Demand Relative to GNP
3.2 Unemployment and Inflation

3. AGGREGATE DEMAND, UNEMPLOYMENT, AND INFLATION

3.1. Aggregate Demand Relative to Potential GNP

3.1.1. Aggregate demand

a. The equilibrium level of gross national expenditure is frequently called aggregate demand. That is, aggregate demand is the level of GNP for which desired and actual gross national expenditure are equal. In terms of the simple income-expenditure model, aggregate demand is equal to the solution values E* and Y*. In the following, aggregate demand will be represented by the symbol Y*.

b. In the income-expenditure model, which seeks to explain how the level of aggregate demand is determined, there is nothing tending to make aggregate demand equal to potential GNP. As explained by that simple model, aggregate demand can be greater or less than potential GNP. Figures 3.1a and 3.1b depict these two situations. Aggregate demand (Y*) is greater in one case, and smaller in the other, than potential GNP (Y_p).

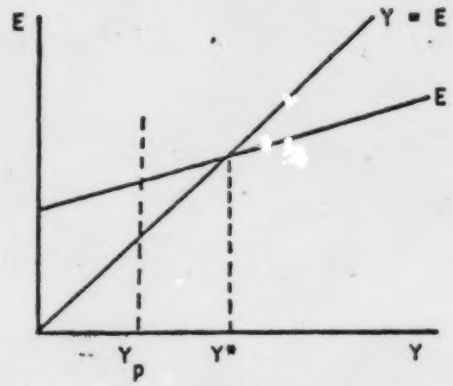


Figure 3.1a

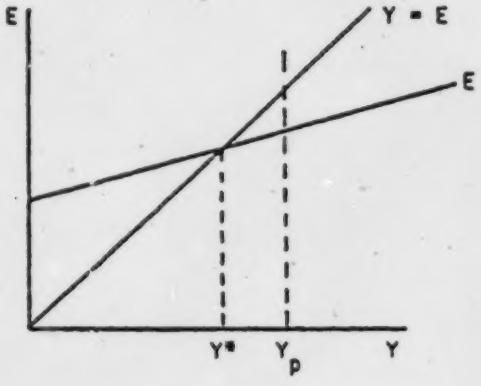
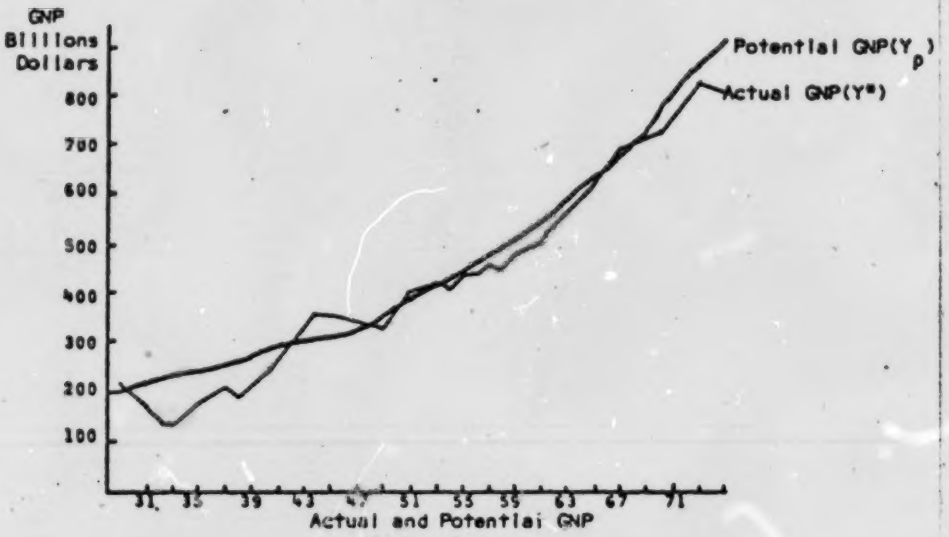


Figure 3.1b

c. In more complex macroeconomic models, aggregate demand is not completely independent of potential GNP as it is in the simple model. Such models will be discussed more fully later in the course. It should be understood, however, that the simple model captures an essential characteristic of the real world -- namely, aggregate demand does not automatically equal potential GNP in the short run.

Example: *As can be seen in Figure 3.2., Y^* has frequently been less, and occasionally greater, than Y_p. This is*

consistent with the absence in the income-expenditure model of any tendency for aggregate demand to equal potential GNP.



Actual and Potential GNP
Figure 3.2

In 1933, for example, the economy was in the depths of the great depression. Aggregate demand in 1958 prices was about 80 billion dollars, or more than 35 percent below potential GNP. In 1944 the economy was engaged in World War II. Aggregate demand was then about 50 billion dollars, or nearly 17 percent greater than potential GNP. The situation in 1944 corresponds to Figure 3.1a, and the situation in 1933 to Figure 3.1b.

3.1.2. Aggregate demand and unemployment

a. When aggregate demand (Y*) equals potential GNP (Y_p), then actual output will tend toward an equilibrium where producers are producing all of the output they are normally capable of producing. In such a situation the economy is considered to be at full employment. It should be remembered (see section 1.3.4) that the full employment unemployment rate (U_f) will be greater than zero because of frictional and structural unemployment.

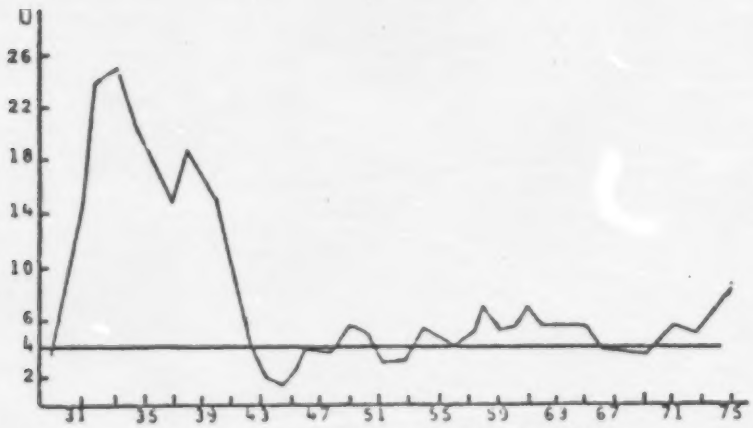
b. If Y* is less than Y_p, then actual GNP will tend toward a level at which producers cannot sell all that they are capable of producing with the available supply of resources. That is, the economy will converge to an equilibrium where the output that households, businesses, and

government are willing to buy can be produced with fewer resources than are available. As a consequence, the unemployment rate will exceed U_f.

Example: *In 1975, actual GNP in 1958 prices was $123 billion, or about 13 percent below potential GNP. The unemployment rate was 8.5 percent which is well above U_f, usually considered to be 4 percent.*

c. If Y* exceeds Y_p, then actual GNP will tend toward a level which exceeds the amount that producers are capable of producing with the supply of resources normally available. This is possible by reducing the amount of frictional unemployment so that the unemployment rate falls below U_f. In this situation there will be fewer unemployed persons than there are unfilled jobs.

Example: *As can be seen in Figure 3.3, the unemployment rate has been below 4 percent since 1929 on only three occasions: 1942-45, 1951-53, and 1966-69. All three periods were during wartime when aggregate demand was very high relative to potential GNP. (Later in the course, the question of why there have not been more frequent periods when Y* exceeded Y_p will be considered.)*



Unemployment Rate (1929-1975)
Figure 3.3

d. How high the unemployment rate (U) is in any period will depend on the relationship between Y* and Y_p. The number of persons employed in any

period will vary with the amount of output produced. The higher GNP is in any given period, the greater employment will be in that period. The lower Y* is relative to Y_p, the lower employment is relative to the labor force. That is, the larger the GNP gap in any period, the higher will be the level of U.

Definition: GNP gap -- the difference between actual and potential GNP.

Example: *If in any year Y* is less than Y_p, then the GNP gap will be positive. This can be seen in Figure 3.4 which corresponds to 1975.*

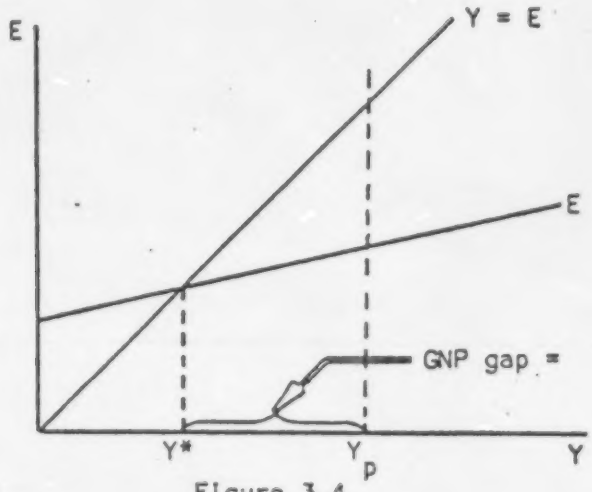


Figure 3.4

Because Y (810) was less than Y_p (933), producers did not employ all of the available labor force. Consequently, U was much higher than U_f, i.e., 8.5% as compared to 4%.*

e. Studies have shown that the relationship between U and the % GNP gap for the ranges of these variables observed since 1947 can be approximated by the following equation known as Okun's Law, named after the economist who first identified it:

$$U = U_f + c \times \% \text{ GNP gap}$$

where c is a parameter. This relationship can also be expressed as follows:

$$\% \text{ GNP gap} = \frac{1}{c} (U - U_f)$$

Definition: % GNP gap -- the percentage difference between actual and potential GNP.

$$\% \text{ GNP gap} = \frac{\text{potential GNP} - \text{actual GNP}}{\text{potential GNP}} \times 100$$

Example: *In his study, Okun estimated the parameter c to be equal to 1/3. That is,*

$$U = U_f + \frac{1}{3} x \ \% \text{ GNP gap;}$$

or to rearrange the relationship in terms of % GNP gap,

$$\% \text{ GNP gap} = 3(U - U_f).$$

According to Okun, given, for example, a full employment unemployment rate of 5 percent and a GNP gap of 3 percent, then the actual unemployment rate will be 8 percent. Looked at the other way, if the GNP gap is 12 percent, then the unemployment rate will be 9 percent, i.e., 4 percentage points higher than the full employment unemployment rate.

f. Okun's Law is shown graphically in Figure 3.5. The % GNP gap is measured on the horizontal axis and U on the vertical axis. For a % GNP gap of zero, U equals U_f. For a positive % GNP gap, $U > U_f$, and for a negative % GNP gap, $U < U_f$. The slope of the line is equal to the parameter c and indicates by how much U increases as the % GNP gap increases.

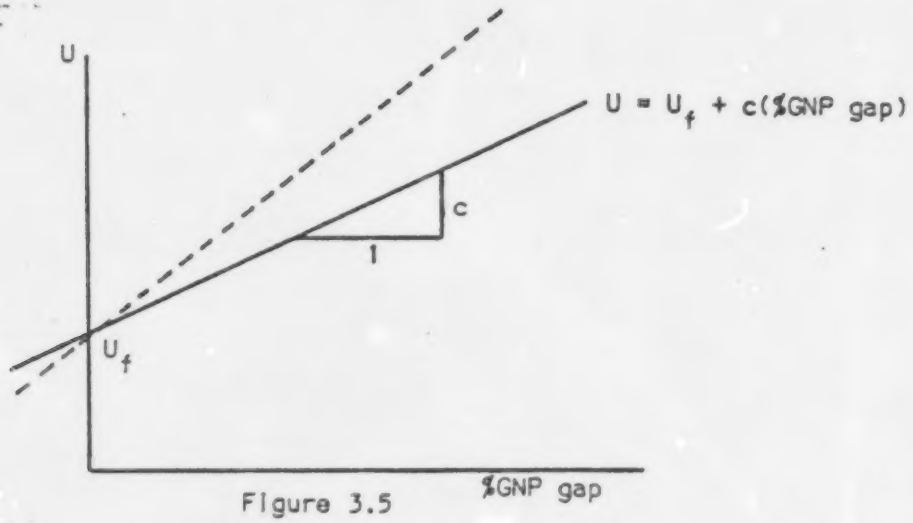


Figure 3.5

Example: *If $c = 1/3$ as Okun has estimated, then in order to have U lower by 1 percentage point in any year, it would be necessary to have Y^* about 3 percent higher. Recently some economists have argued that c is now larger than it used to be because a larger proportion of unemployed workers are less productive teenagers and middle-aged women than used to be the case. If this is true, then the relationship between U and the % GNP gap is like the dashed line in Figure 3.5. This would mean that a smaller increase in Y^* would be necessary to reduce unemployment than is implied by Okun's study.*

3.1.3. Aggregate demand and inflation

a. If aggregate demand is equal to potential GNP, the theory of supply and demand might suggest that there would be no tendency for prices to rise or fall. When the amount of output that households, businesses, and government want to buy just matches potential GNP, it could be expected that there would be neither excess demand nor excess supply in markets and, as a consequence, that there would be price stability.

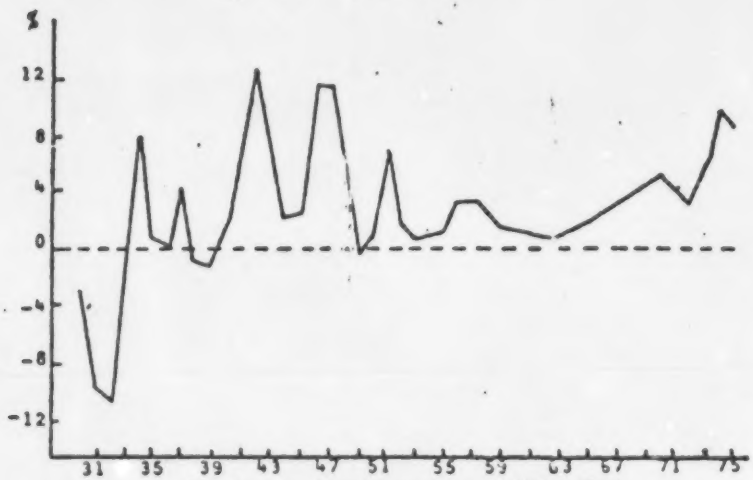
b. For reasons that will be explained in Section 3.2., however, there appears to be an inflationary bias in the economy. That is, when aggregate demand equals potential GNP, instead of the average price level remaining constant, as a simple application of the theory of supply and demand might suggest, the rate of inflation is positive.

Example: *For the period since 1954, in years when the unemployment rate was between 4 and 5 percent, i.e., in years when Y^* was near to but probably not greater than Y_p, the average rate of inflation was around 3.6 percent.*

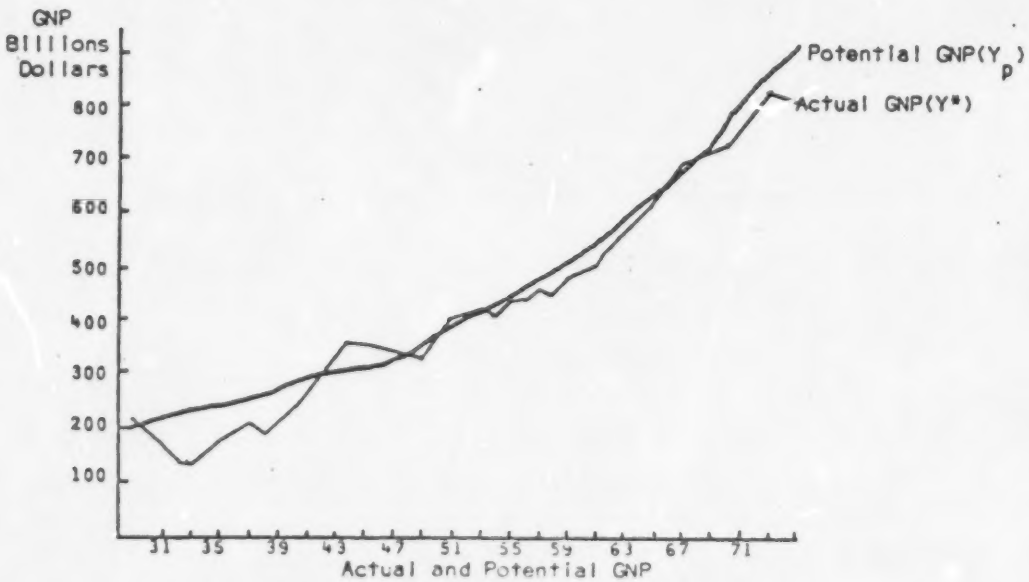
c. When aggregate demand is less than potential GNP, the theory of supply and demand would suggest that there would be deflation. For a variety of reasons, however, the average price level tends to be rigid in a downward direction. These reasons include government control of prices in some markets (for example, many agricultural products and regulated industries such as transportation and energy), and the existence of long-term fixed price contracts (for example, negotiated labor contracts

between employers and labor unions). As a result, except for periods when the GNP gap is very large, the average price level does not ordinarily decrease when aggregate demand is below potential GNP. The inflation rate does, however, tend to be lower when there is a GNP gap than when the economy is at full employment.

Example: *As shown in Figures 3.6a and 3.6b, the average price level rarely decreases even when aggregate demand falls below potential GNP. For the period since 1929, there was deflation only during the 1930's when the unemployment rate was extremely high.*



Change in GNP Deflator (1930-1975)
Figure 3.6a



Actual and Potential GNP
Figure 3.6b

d. When aggregate demand exceeds potential GNP, the theory of supply and demand suggests that inflation will result. This implication appears to be supported by the evidence. Whenever excess demand pervades the economy, the result is a rate of inflation that is greater than the rate observed on average when aggregate demand and potential GNP are approximately equal.

Example: *In Figures 3.6a and 3.6b, whenever actual GNP was driven above potential GNP -- in the early 1940's, the early 1950's and the late 1960's -- the rate of inflation was substantially above average for the period since 1929.*

A closer look at the 1960's, as in Table 3.1 below, provides additional evidence of the tendency for prices to rise faster when Y^* is greater than Y_p than when Y^* is less than Y_p.

Table 3.1

		average U	*average* $\frac{\Delta P}{P}$
1960-65	$Y^* < Y_p$	*5.5*	*1.5%*
1966-69	$Y^* > Y_p$	*3.7*	*3.7%*

3.1.4. Inflationary bias in the economy

a. The economy is composed of many individual markets. Even at full employment some of those markets will be characterized by excess demand and others by excess supply at initial prices. This is why the full employment unemployment rate is greater than zero. All markets are not always in equilibrium and there are always some resources in the process of shifting from markets with excess supply to markets with excess demand.

Example: *Between 1973 and 1974 the demand for automobiles fell sharply while the industry's capacity to produce increased. At the same time, the demand for agricultural output rose sharply while its capacity to produce was reduced slightly due to poor weather. Consequently, if prices remained the same between 1973 and 1974, there would be excess supply of autos and excess demand for agricultural output. This can be seen in Figures 3.7a and 3.7b.*

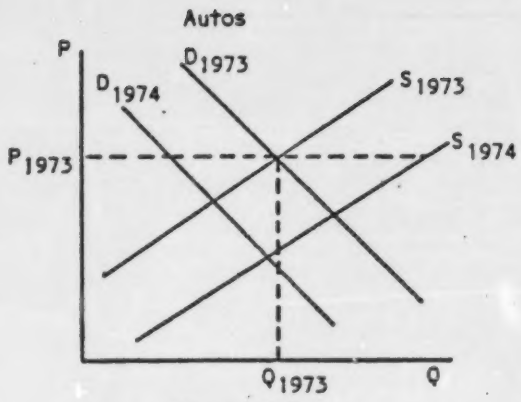


Figure 3.7a

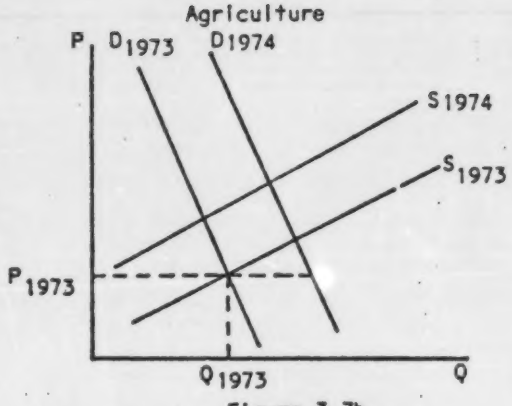


Figure 3.7b

b. If prices were perfectly flexible, it could be expected that prices would go up in markets with excess demand and down in markets with excess supply to restore equilibrium. Then price increases in some markets would be offset by decreases in others and, at full employment, there would be no reason to expect either inflation or deflation.

Example: *If the prices of autos and agricultural products were perfectly flexible, the price of autos would have fallen from 1973 to 1974, and the price of agricultural products would have risen, as in Figures 3.8a and 3.8b*

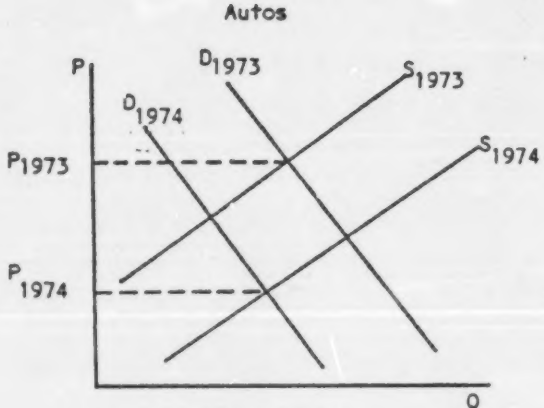


Figure 3.8a

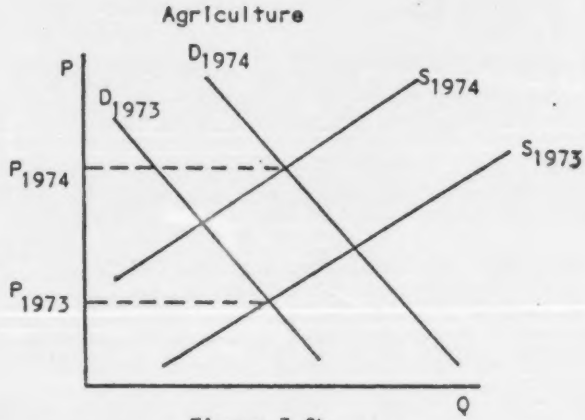


Figure 3.8b

c. The existence of downward price rigidity, however, prevents prices from falling rapidly in markets with excess supply as they increase in markets with excess demand. As a consequence, at full employment, the price increases in markets with excess demand are not offset by price

decreases in markets with excess supply, and the inflation rate is positive.

Example: *In fact between 1973 and 1974 the prices of agricultural products rose by 18 percent per year while the prices of autos rose by 4 percent per year. That is, the price of agricultural output responded to the upward pressure of supply and demand, while the price of autos did not respond in like manner to the downward pressure of supply and demand. In one sector prices rose to eliminate the excess demand. In the other sector prices did not fall to eliminate excess supply. As a result, the average price level for these two sectors rose much more than would have been the case had there not been downward price rigidity in the automobile industry.*

d. As aggregate demand decreases relative to potential GNP, the number of markets with excess demand decreases and the number of markets with excess supply increases. Thus, as unemployment increases the inflation rate decreases until a level of unemployment is reached where the price increases in the relatively few markets with excess demand are fully offset by the price decreases in the relatively many markets with excess supply.

e. In summary, the fact that the economy is composed of many individual markets, a good number of which are characterized by downward price rigidity, causes there to be an inflationary bias.

3.2. Unemployment and Inflation

3.2.1. The Phillips curve

a. In section 3.1 it was stated that when aggregate demand equals potential GNP, the rate of unemployment will equal U_f and the rate of inflation $\left(\frac{\Delta P}{P}\right)$ will be positive. For higher levels of aggregate demand, given potential GNP, the unemployment rate will be lower and the inflation rate will be higher than when Y^* equals Y_p. For lower levels of aggregate demand, the unemployment rate will be higher and the inflation rate lower than would prevail if Y^* were equal to Y_p.

Example: *In Figure 3.9 inflation and unemployment data for the 1960's is plotted. Those data clearly show that low U's tend to be associated with high rates of inflation $\left(\left|\frac{\Delta P}{P}'s\right|\right)$, and vice versa. The line drawn through these points can be thought of as an approximation to the relationship between unemployment and inflation that existed in the 1960's.*

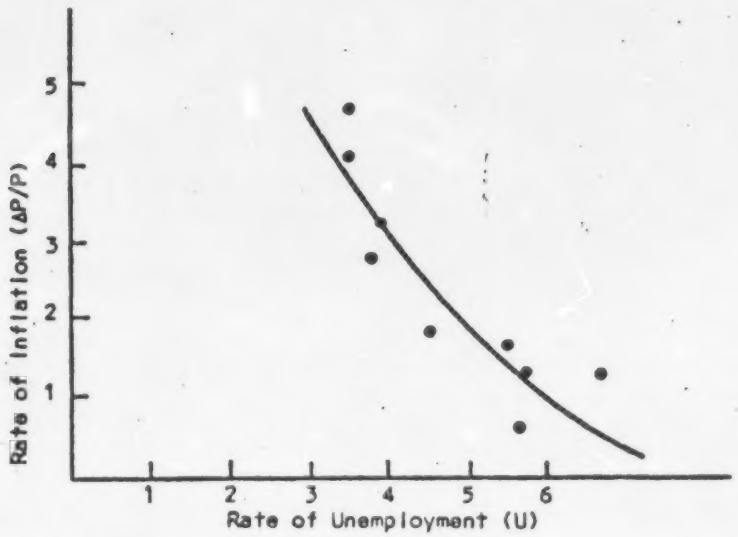


Figure 3.9

b. The analysis of Section 3.1 and the data for the 1960's given in Figure 3.9 suggest that there is an inverse relationship between unemployment and inflation as depicted in Figure 3.10. That is, for lower unemployment rates there will be higher inflation rates, and vice versa. This relationship is called the Phillips Curve, named after the economist who first observed it.

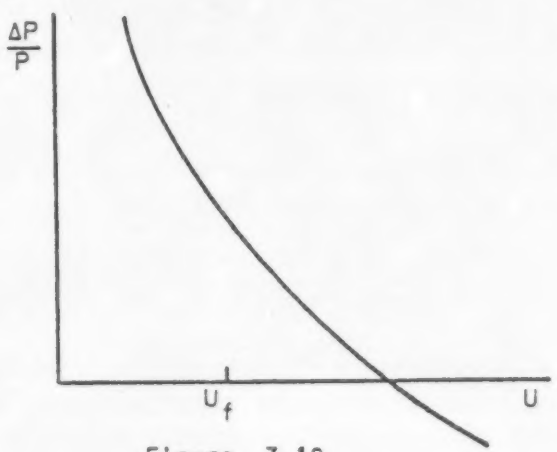


Figure 3.10

c. Two features of the Phillips Curve which should be remembered:

(i) At U_f, the rate of inflation is positive. This is because of the inflationary bias discussed above.

(ii) The inflation rate decreases as U increases. This is the inverse (i.e., downward sloping) relationship discussed in the preceding section.

d. A detailed analysis of the Phillips Curve would show that the curve tends to get flatter as U increases and that it can never cross the vertical axis since a negative unemployment rate has no meaning. Consequently, the Phillips Curve is not a straight line, but takes the shape shown in Figure 3.9. For the sake of simplicity, however, the Phillips Curve will be represented by a straight line approximation to the non-linear curve of Figure 3.9. In equation form the Phillips Curve will be written as:

$$\frac{\Delta P}{P} = d - eU.$$

Diagrammatically, this equation takes the form shown in Figure 3.11.

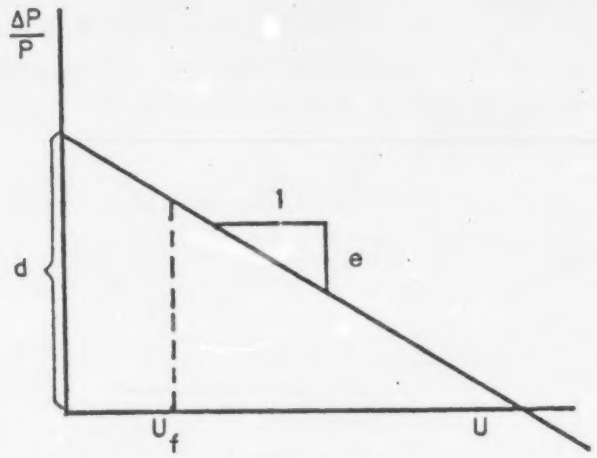


Figure 3.11

e. Sometimes the Phillips Curve does not appear to provide a good explanation for real world events. Occasionally, the economy has mugh higher or lower inflation, given unemployment, than is predicted by a fixed Phillips Curve. Some economists interpret this as the result of shifts in the Phillips Curve. There are several reasons why the

Phillips Curve might shift up:

(1) There may be a change in people's expectations about future inflation which causes them to do things in the present, such as ask for higher wages, which, in turn, causes prices to rise in the present.

(2) There may be a change in the composition of demand or supply which causes there to be more imbalance than normal across markets in the economy and which, thereby, increases the inflationary bias of the economy.

(3) There may be an increase in the world-wide rate of inflation due to events occuring in other countries which causes prices in the U.S. to rise more rapidly.

Later in the course, those factors which might cause the Phillips Curve to shift will be analyzed in greater detail.

Example: *For the 1960's a fixed Phillips Curve provided a relatively good explanation of real world events, as was seen in Figure 3.9. In the 1970's, however, the inflation rate was much higher than that which the 1960's Phillips Curve predicted. In other words, the Phillips Curve appeared to shift dramatically upward in the early 1970's. This can be seen in Figure 3.12 which compares data from the 1960's with data from the 1970's.*

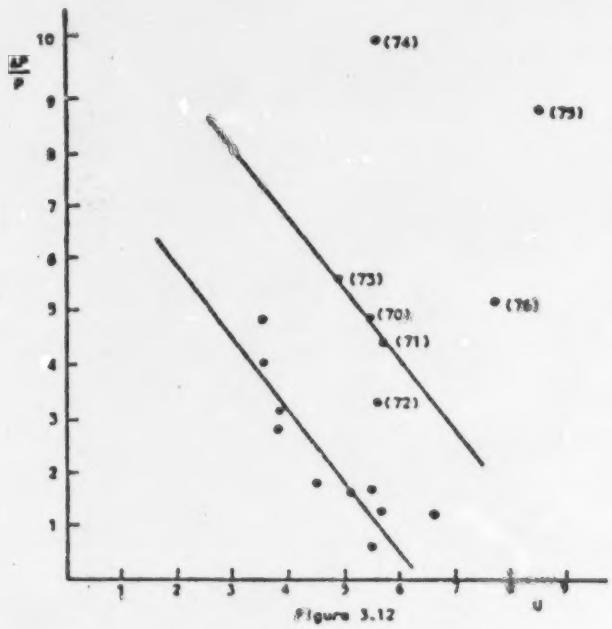


Figure 3.12

Data for the years 1970-1973 appear to lie on a Phillips Curve that is substantially higher than the 1960's Phillips Curve, and data for 1974-1976 appear to lie on curves that were even higher.

f. Algebraically, a shift of the Phillips Curve can be thought of as an autonomous change in the parameter d. A larger d corresponds to a higher Phillips Curve. For the next several sections, the analysis will presume that there is a given Phillips Curve for the current period. At a later stage of the course, the problems relating to a shifting Phillips Curve will be reconsidered.

3.2.2. Expanding the model

a. Given the existence of Okun's Law and the Phillips Curve, the unemployment rate and the inflation rate are determined by the level of aggregate demand relative to potential GNP as follows: The level of aggregate demand is determined as in the income-expenditure model. Since potential GNP is predetermined, the level of aggregate demand determines the GNP gap. Following Okun's Law, the size of the % GNP gap determines the unemployment rate. And, as indicated by the Phillips Curve, for that unemployment rate there will be a corresponding rate of inflation.

b. In equation form this can be represented as follows:

Income-expenditure model: $$Y^* = \frac{a}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G}$$

Okun's Law: $$U^* = \bar{U}_f + c\left[\frac{\bar{Y}_p - Y^*}{\bar{Y}_p}\right]$$

Phillips Curve $$\left[\frac{\Delta P}{P}\right]^* = d - eU^*$$

c. The way in which unemployment and inflation are determined by the expanded model can be summarized as follows:

(i) Y^* is determined in the income-expenditure model;

(ii) given Y^*, U^* is determined by Okun's Law;

(iii) given U^*, $\frac{\Delta P}{P}$ is determined by the Phillips Curve.

d. The implication of this model for the behavior of unemployment and inflation are as follows:

(i) If aggregate demand exceeds potential GNP, there will be an unusually low unemployment rate and an unusually high inflation rate;

(ii) If aggregate demand equals potential GNP, the unemployment rate will equal U_f, but there will be a positive rate of inflation;

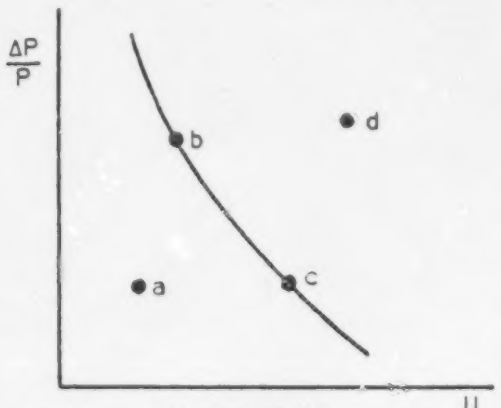
(iii) If aggregate demand falls short of potential GNP, the economy will have high unemployment but low inflation;

(iv) If there is some change in aggregate demand (whether due to the influence of government policy, or changes in consumer or business spending plans), there will be a change in the unemployment and inflation rates.

3.2.3. Choosing target rates of inflation and unemployment

a. As discussed in section 3.2.1., in any period policy makers will be confronted by a given Phillips Curve. While it may shift over time from one position to another, the present model assumes that it is in a fixed position for the current period. (Later in the course we will consider situations whereby positive actions might be taken to shift the curve.) This means that in the present model policy makers have only a limited set of unemployment and inflation rate combinations to choose from as targets for the current period.

Example: *Suppose the economy has the Phillips Curve in Figure 3.13. This means that the points like a and d, which lie below and above the curve cannot be achieved in the current period. Points which can be achieved are those, like b and c, which lie on the Phillips Curve.*



81 Figure 3.13

b. The policy maker must then decide which of the feasible unemployment-inflation combinations, i.e., which of the points on the Phillips Curve, is best from society's point of view. In comparing any two points on the Phillips Curve, since it is negatively sloped, one point will have higher unemployment, but lower inflation, than the other. When considering whether to move the economy from one point to another, the policy maker must judge whether the decrease in unemployment (or inflation) makes society better off by more than the increase in inflation (or unemployment) makes society worse off.

Example: *In Figure 3.14 two points (b and c) on the Phillips Curve are labelled. In trying to choose the best of all possible points the policy maker must be able to say which of any two points, such as b and c, is preferred. If b is preferred to c, then a movement from b to c involves a loss in social welfare due to the increase in unemployment that exceeds the gain in social welfare due to the decrease in inflation.*

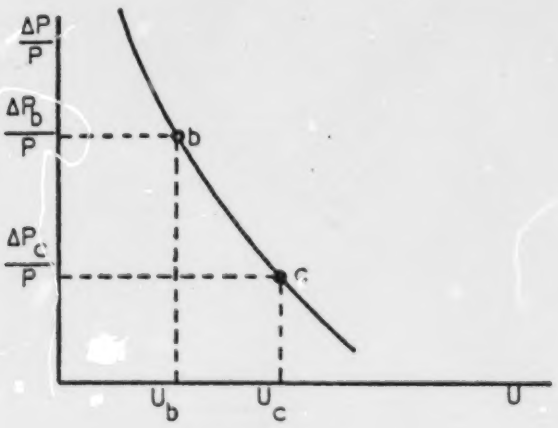


Figure 3.14

c. The point on the Phillips Curve preferred to all other points on the Phillips Curve is the one which maximizes social welfare as judged by policy makers. It is the responsibility of policy makers, within the political system, to make such subjective judgments. The point selected is the one toward which policy makers will try to move the economy. In other words, the point on the Phillips Curve which maximizes social welfar

defines the target rates of unemployment and inflation which policy makers will try to achieve by manipulating the instrument variables under their control.

Example: *An example of a social welfare function for which unemployment and inflation rates are target variables is the following:*

$$W = -U - \frac{\Delta P}{P}.$$

This function shows the value of W, an indicator of social welfare, for various feasible combinations of $\frac{\Delta P}{P}$ *and U. The higher U, given* $\frac{\Delta P}{P}$, *and the higher* $\frac{\Delta P}{P}$, *given U, the lower will be W. The point on the Phillips Curve which maximizes the policy maker's social welfare function is the desired or target combination of U and* $\frac{\Delta P}{P}$

d. As much as policy makers might like to move the economy toward the origin, where inflation and unemployment rates are both zero, the best they can do is move the economy along the Phillips Curve to the point on it which is preferred to all other points on it. In section 4, the ways in which the government can use its budget decisions to deal with inflation and unemployment will be analyzed.

Example: *In Figure 3.15 three points are indicated -- (0,0), (3,5), and (4,3). In terms of the social welfare function in the preceding example, the corresponding W for each of these points is 0, -8, and -7. Clearly the point (0,0) would be preferred among the three but it is unattainable because it is off the Phillips Curve. As between the two points on the Phillips Curve, (4,3) is preferred to (3,5) because it yields a higher W, -7 as compared to -8.*

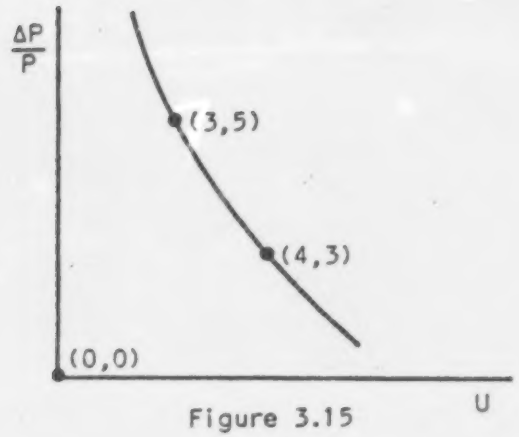


Figure 3.15

MACRO UNIT 4

USING THE EXPANDED MODEL FOR POLICY MAKING

4.1 Fiscal Policy
4.2 The Balanced Budget Multiplier
4.3 Choosing the Size of the Budget Deficit or Surplus
4.4 Endogenous Taxes

4. USING THE EXPANDED MODEL FOR POLICY-MAKING

4.1. Fiscal Policy

4.1.1. Fiscal policy objectives

a. As was discussed in section 1, government expenditure is a major component of gross national expenditure and net taxes are an important determinant of the distribution of gross national income among households, businesses, and government. As a consequence, as was demonstrated in section 2, these variables, which comprise the government budget, are instrument variables which influence the equilibrium values of target variables. In other words, how the government formulates its fiscal policy will have an effect on aspects of the econom of interest to policy makers.

Definition: Fiscal policy -- decisions made by the government about the levels of government expenditure and net taxes.

Example: *The decision to increase government expenditure substantially during World War II and the Vietnam War was a major element in the government's fiscal policy during those periods. Those decisions had a great impact on the economy in general as well as the country's ability to carry out its defense policy.*

b. Given that fiscal policy has an effect on various endogenous economic variables, the question arises as to what the government's goals or objectives should be with respect to those variables. That is, what should be the policy maker's target variables and for what values of those target variables should the policy maker be aiming?

Example: *In making a decision about whether to raise or lower taxes, or to make no change, a prior decision must be made about the purposes of fiscal policy. Should taxes be adjusted to achieve a balanced budget? to avoid inflation? to eliminate unemployment? Without answers to these kinds of questions, it would be impossible to make a rational decision about taxes.*

c. Questions about the goals of fiscal policy do not fall exclusively within the area of economists' professional competence. The answers

to these questions involve value judgments which must be made within the political system. In a representative democracy, like the U.S., it is the responsibility of elected officials and their appointees to formulate the objectives of fiscal policy. While there may be disagreement among individuals about the goals of fiscal policy, a compromise is inevitably arrived at through the workings of the political process.

Example: *Typically, discussion about fiscal policy by Congressmen and the Administration indicates that most policy makers have many goals for fiscal policy. The disagreement that exists lies not so much in identifying target variables, but in determining which ones are most important. In term of a social welfare function of the following form:*

$$W = -aU - b\frac{\Delta P}{P} - c(G-T) - dG$$

debate among politicicians about fiscal policy can be interpreted as disagreement about the size of the parameters a, b, c, and d. Those who argue that government has become too big and that both G and T should be cut back are arguing that the parameter d contained in the policy maker's representation of the social welfare function is too small. Those who emphasize that the budget should be balanced are implicitly arguing for a higher value on the c parameter in the welfare function than is being used by policy makers.

d. With the help of economic analysis of the kind developed in section 3, politicians have come to see that fiscal policy can have an important effect on the rates of inflation and unemployment. Through their effects on aggregate demand, the levels of government expenditure and net taxes will influence what point on the Phillips Curve the economy will converge to in any time period. As a consequence, in formulating fiscal policy, given any other economic policies which might influence aggregate demand, policy makers must decide which point on the Phillips Curve is best. That is, they must decide which attainable combination of unemployment and inflation rates is least undesirable.

e. Fiscal policy also has an effect on endogenous variables other than aggregate demand, unemployment, and inflation. The importance of some of these and their relevance for economic policy will be discussed in subsequent sections. At this point, however, the discussion will abstract from these other effects and focus on the connection between fiscal policy, on the one hand, and aggregate demand, unemployment and inflation, on the other. The reason for this is to facilitate an understanding of this connection which is generally regarded to be the most important aspect of fiscal policy.

f. The value judgments of policy makers can be expressed in terms of a social welfare function. One objective, then, is to formulate a fiscal policy which will move the economy to the point on the Phillips Curve which maximizes the social welfare function. In arguing about the desirability of any fiscal policy, one source of disagreement can be a difference of opinion about what should be the social welfare function, i.e., about whether inflation or unemployment is the greater evil. Even if there is agreement on the objectives of fiscal policy, there can be disagreement about which policy will best achieve those objectives. The following sections are concerned with the problems of how to decide about G and T, given an agreed-upon social welfare function.

4.1.2. Choosing a target level of aggregate demand

a. Assuming that policy makers are confronted by a given Phillips Curve, the must make a decision about where they would like to be on that Phillips Curve. That is, which of the feasible combinations of U and $\frac{\Delta P}{P}$ should the government try to bring about through its fiscal policy? Once that decision is made, the next step for policy makers is to determine what levels of aggregate demand will lead to a realization of the desired combination of unemployment and inflation. This is because fiscal policy influences the point on the Phillips Curve to which the economy will converge through its effect on aggregate demand.

b. The level of aggregate demand that corresponds to the desired point on the Phillips Curve can be found by making use of Okun's Law, the relationship between unemployment and the output gap. Okun's Law states that

$$U^* = U_f + c\left[\frac{Y_p - Y^*}{Y_p}\right].$$

That is, the equilibrium unemployment rate is equal to the full employment unemployment rate plus an amount which depends on the percentage gap between aggregate demand and potential GNP. The amount of unemployment is inversely related to the level of aggregate demand. The higher the level of aggregate demand, the lower will be the level of unemployment, ceteris paribus. Anything which increases the rate of total spending in the economy should reduce the level of unemployment. If the policy maker knows c and Y_p, he can use this relationship to find the Y^* which corresponds to the desired or target unemployment rate.

c. Let the subscript t denote the target level of a variable. Then by using Okun's Law, it is possible to find the target level of aggregate demand, Y_t^*, in terms of the target unemployment rate, U_t^*. Remember U_t^* is given by the point on the Phillips Curve which is preferred to all other points on the Phillips Curve, i.e., the point on the Phillips Curve which maximizes social welfare. What we are doing here is asking ourselves this question: If we have to endure some combination of both inflation and unemployment, which combination makes us the least worse off? The answer to that question gives us our target level of unemployment, and putting this unemployment figure together with Okun's Law give us our target level of aggregate demand or equilibrium GNP. By algebraic manipulation, the relationship

$$U_t^* = U_f + c\,\frac{Y_p - Y_t^*}{Y_p}$$

implies the following relationship:

$$Y_t^* = Y_p - \frac{1}{c}\,(U_t^* - U_f)\,Y_p.$$

Example: *Suppose that after considering possible combinations of inflation and unemployment for our economy, the policy maker decides that the least undesirable situation involves an unemployment rate of 6%. The target level of unemployment, U_t^*, is then .06. If a 5% unemployment rate is considered to be "full employment", and if the economy could produce a GNP of 1500 at full employment, then U_t is .05 and Y_p is 150 Finally, suppose that historical experience suggests that th "c" in Okun's Law is about 1/3 for the economy.*

-Substituting these values in the above equation,

$$Y_t^* = 1500 - 3(.06 - .05)\ (1500)$$
$$= 1500 - 45$$
$$= 1455.$$

In other words, if the policy maker can manipulate the level of total spending in the economy to produce an aggregate demand of 1455, then the resulting rate of unemployment should be about 6%. How can the policy maker manipulat the amount of total spending in the economy? The most direc method is the use of fiscal policy, i.e., adjusting levels of government spending and taxation.

d. It should be noted that the choice of a U_t which is different from U_f implies that Y_t^* will be different from Y_p. The reason why policy makers might seek a Y* less than Y_p is that the inflation that would result at Y_p might be greater than acceptable, given the policy makers' social welfare function.

Example: During the Nixon-Ford Administration in the early 1970's, it was clearly stated that the Administration's Y_t^* was less than Y_p because of the desire to lessen the rate of inflation. This was during the period after the Phillips Curve had shifted upward dramatically.

e. The relationship between the Phillips Curve and Okun's Law can be summarized in terms of a graph. Figure 4.1a is a Phillips Curve for an economy. Figure 4.1b is a graphic representation of Okun's Law applied to many possible target levels of unemployment; it shall be referred to as the Okun relationship. The line denotes possible combinations of target unemployment rates (U_t) and the corresponding levels of equilibrium GNP (Y_t^*) in an economy where the definition of "full employment" and the GNP that could be produced at full employment (U_f and Y_p) are held constant. In making policy decisions which affect the levels of inflation and unemployment in an economy, policy makers are assumed to go through a three-step process:

(1) Given that it is necessary to endure some combination of inflation and unemployment, the policy maker must choose the point on the Phillips Curve considered to be least

undesirable. Selection of a point such as R_2 on the Phillips Curve in Figure 4.1a determines the economy's target rate of unemployment. At point R_2, $U_2 = U^*_t$.

(2) Given U^*_t it is possible to use the Okun relationship in Figure 4.1b to determine the level of equilibrium GNP which yields the target rate of unemployment. That particular GNP then becomes the target GNP, Y^*_t. In Figure 4.1b, if the target rate of unemployment is U_2, then point R'_2 shows the target level of GNP, Y^*_2.

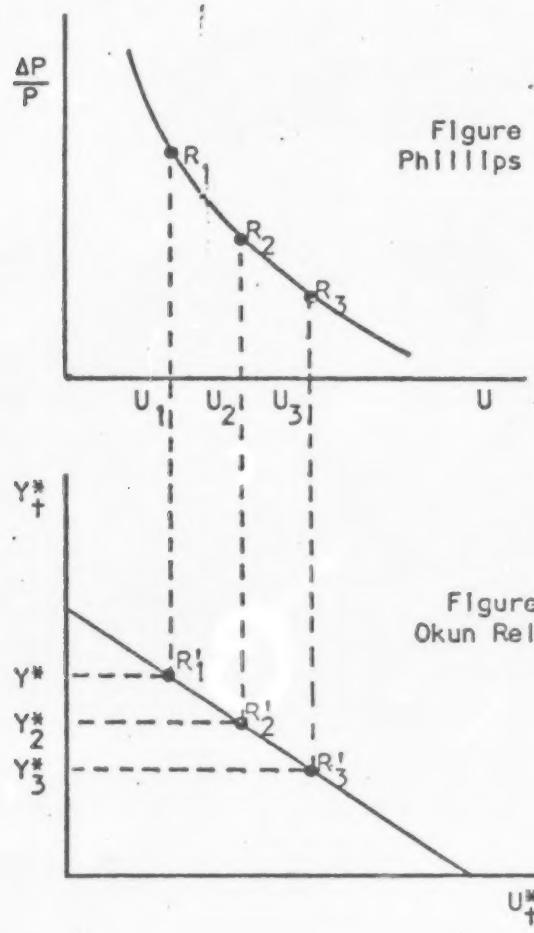


Figure 4.1a
Phillips Curve

Figure 4.1b
Okun Relationship

Notice from the graph of the Okun relationship that the lower the target rate of unemployment, the higher will be the level of GNP required to obtain that target. The level of GNP required to yield an unemployment rate of

U_3 (Y_3) is less than the GNP required to yield a lower unemployment rate U_1 (Y_1) since more spending is required to create more jobs as the amount of tolerable unemployment falls.

(3) Given a Y_t^* which corresponds to the desired point on the Phillips Curve, the policy maker's problem then becomes one of choosing a budget which is consistent with that target level of aggregate demand. If the policy maker solves this problem, then he will have chosen a fiscal policy which will achieve the target level of aggregate demand which in turn will achieve the target unemployment rate. In other words, the policy maker will have used fiscal policy to achieve the desired point on the Phillips Curve.

4.1.3. Choosing the levels of the instrument variables.

a. Given the target level of aggregate demand, Y_t^*, determined by the procedure spelled out in sections 4.1.1 and 4.1.2, the policy maker can then use the income-expenditure model to find values of $\bar{T}$ and $\bar{G}$ which, given the values of other exogenous variables, will yield Y_t^*. It is possible to find these values by considering the reduced form equation for Y*:

(5) $$Y^* = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G} - \frac{b}{1-b}\bar{T}$$

This equation gives the equilibrium level of aggregate demand in terms of the parameters of the income-expenditure model (a and b) and the values of the exogenous variables ($\bar{I}$, $\bar{G}$, and $\bar{T}$). If the government knows a, b, and $\bar{I}$, it can choose levels of $\bar{G}$ and $\bar{T}$ which make Y* equal to Y_t^*. It is assumed that the government will know the values of a, b, and $\bar{I}$. One of the economist's contributions to policy making is undertaking research which provides estimates of a and b and forecasts of $\bar{I}$.

b. If the policy maker wanted to use government expenditure as the instrument variable to achieve Y_t^*, then he would simply choose the value of $\bar{G}$ which would yield a value of Y_t^* in the reduced form equation for Y*. This can be seen diagrammatically in Figure 4.2. The Line $C = a + bY - b\bar{T}$

shows the level of consumption expenditure which will obtain for any value of Y. The line $C + \bar{I}$ shows the level of consumption plus investment expenditure which will obtain for any value of Y. The problem is to find the value for $\bar{G}$ which will yield Y_t^* as the equilibrium value for Y. The solution is the value for $\bar{G}$ which will cause the $C + I + \bar{G}$ line to intersect the $E = Y$ line at the point where $Y = Y_t^*$. This of course is the difference between Y^* and the level of $C + \bar{I}$ which will obtain at Y_t^* as shown by the vertical difference between the $C + \bar{I}$ line and $C + \bar{I} + \bar{G}$ line in the diagram. In other words, $\bar{G}$ must be just sufficient to make $C + \bar{I} + \bar{G}$ add up to Y_t^*.

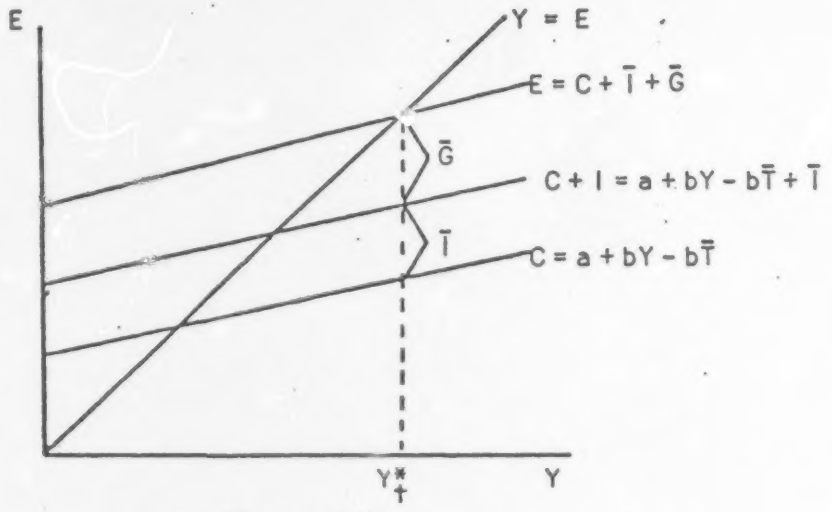


Figure 4.2

Example: *Suppose $Y_t^* = 1400$, $a = 100$, $b = .75$, $\bar{I} = 250$ and $\bar{T} = 200$. In order for the economy to be in equilibrium when $Y = Y_t^*$, it is necessary for desired $C + \bar{I} + \bar{G}$ to be equal to Y_t^*. If Y were equal to Y_t^*, then desired consumption expenditure is given by*

$$C = a + b(Y - T)$$
$$= 100 + .75\ (1400 - 200)$$
$$= 1000.$$

Since desired $I = 250$, then $C + \bar{I}$ would be 1250, if $Y = 1400$. In order for Y to be an equilibrium Y at 1400, $C + \bar{I} + \bar{G}$ would have to equal 1400 when $Y = 1400$. That is, $\bar{G}$ would have to be 150.

c. It is useful to think about the same problems in terms of changes in $\bar{G}$ from existing levels. If aggregate demand is at a level which is different from Y^*_t, by how much should it be changed to achieve Y^*_t? In terms of the reduced form equation for Y*, for given levels of $\bar{I}$ and $\bar{T}$,

$$\Delta Y^* = \frac{1}{1-b}\,\Delta\bar{G}.$$

This implies that to achieve a change in Y* from the initial level, Y^*_1, to the target level, Y^*_t, it is necessary to change $\bar{G}$ by (1-b) times that amount. In terms of Figure 4.3, Y^*_1 is the initial level of Y and Y^*_t the target level. The change in G required is indicated by ΔG, i.e., the change necessary to shift the $C + \bar{I} + \bar{G}$ line to the position where it intersects the Y = E line at Y^*_t.

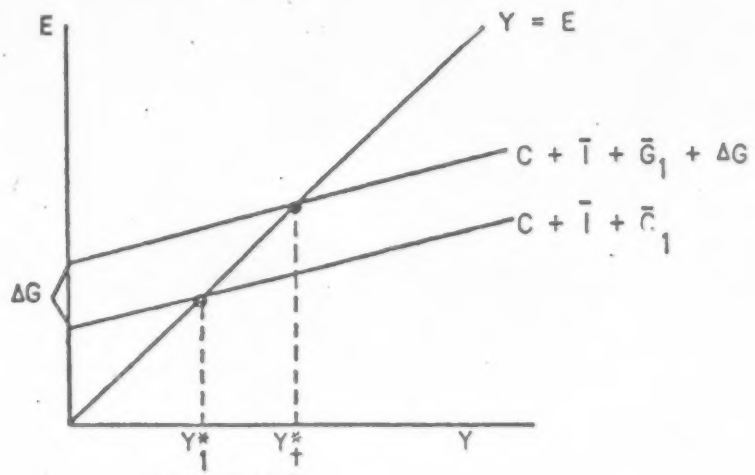


Figure 4.3

Example: *Assume the following values for an economy:*
$C = 50 + .8(Y - \bar{T})$, $\bar{I} = 110$, $\bar{G} = 200$, $\bar{T} = 200$, *and*
$Y_t = Y_p = 1100$.
How should the government adjust its spending policies to make actual GNP equal full-employment, target GNP ($Y^* = Y_p$)

First, find Y for this economy:*

$$Y^* = C + \bar{I} + \bar{G}$$
$$Y^* = 50 + .8(Y^* - 200) + 110 + 200$$
$$Y^* = 360 + .8Y^* - 160$$
$$Y^* = 200 + .8Y^*$$
$$.2Y^* = 200$$
$$Y^* = 1000.$$

Next, determine how much government spending must be increased *to make* $Y^* = 1100$*:*

$$\Delta Y^* = \frac{1}{1-b}\,\Delta\bar{G}$$

$$100 = \frac{1}{1-.8}\,\Delta\bar{G}$$

$$100 = 5\Delta\bar{G}$$

$$\Delta\bar{G} = 20$$

In other words, if government spending is increased by 20 (from 200 to 220), then Y^* *will increase by 100 (from 1000 to 1100). The required change in government spending is smaller than the desired change in GNP because of the government spending multiplier.*

d. The same analysis can be used to find the level of $\bar{T}$ which, for given levels of $\bar{I}$ and $\bar{G}$, will achieve $Y^*_\dagger$. In terms of changes in $\bar{T}$ from existing levels, to bring about a change in Y^* from its initial level to $Y^*_\dagger$, it is clear from the above equation that for constant $\bar{I}$ and $\bar{G}$

$$\Delta Y^* = \frac{b}{1-b}\,\Delta\bar{T}$$

Therefore, if the policy maker wants to increase Y^* by a certain amount by changing taxes, it is necessary to reduce taxes by $\frac{1-b}{b}$ times that amount.

Example: *Suppose the government wants to increase* Y^* *by 150 by changing* $\bar{T}$*. Suppose its estimate of* b *is .75. Then, since*

$$\Delta Y^* = \frac{b}{1-b}\,\Delta\bar{T}$$

$$= -\frac{.75}{.25}\,\Delta\bar{T}$$

$$= -3\Delta\bar{T},$$

in order to make $\Delta Y^* = 150$*,* $\Delta\bar{T}$ *must equal* $-\frac{1}{3}\,\Delta Y^*$ *or* -50*. If* $\Delta\bar{T} = -50$*, then*

$$\Delta Y^* = -3\ (-50)$$

$$= 150.$$

e. Diagrammatically, the effect of a change in taxes can be seen in Figure 4.4. The solid lines show the relationship between C and Y, and E and Y, before the tax change. The dashed lines show these relationships

after a reduction in taxes of $\Delta\bar{T}$. Both the C line and E line shifted up by the amount $-b\Delta\bar{T}$ to C_2 and E_2, resulting in an increase in Y* of $-\frac{b}{1-b}\Delta\bar{T}$ from Y_1^* to Y_2^*.

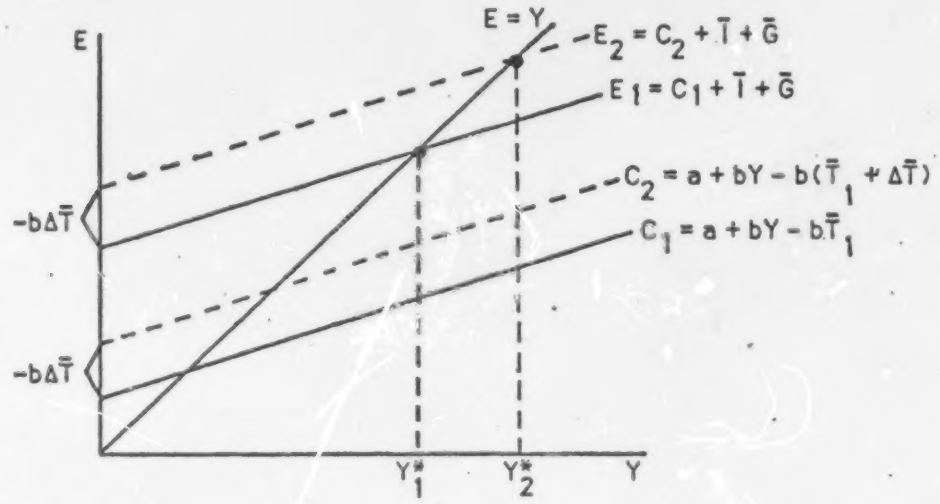


Figure 4.4

Example: *Suppose President Carter's proposed tax rebate of $50 per person had been enacted into law. The effect would have been to shift up the C line and the E line. Originally, Carter's estimates of a and b and his forecast for $\bar{I}$ indicated that the rebate would be necessary to increase Y* to Y_t^*. Changes in these estimates and forecasts, however, led him to conclude that the tax rebate was not necessary to bring Y* up to Y_t^*, but in fact would have driven Y* above Y_t^*.*

4.2. The Balanced Budget Multiplier

4.2.1. The government expenditure and tax multipliers differ

a. As can be seen in the discussion of section 4.1.4, the $\bar{G}$ and $\bar{T}$ multipliers are not equal. A change in government expenditure, ceteris paribus, results in a change in aggregate demand equal to $\frac{1}{1-b}$ times the change in government expenditure, whereas a change in taxes, ceteris paribus, results in a change in aggregate demand equal to $-\frac{b}{1-b}\Delta\bar{T}$. The difference can be seen clearly in equation form:

$$\Delta Y^* = \frac{1}{1-b}\Delta\bar{G}, \text{ for given } \bar{I} \text{ and } \bar{T};$$

$$\Delta Y^* = -\frac{b}{1-b}\Delta\bar{T}, \text{ for given } \bar{I} \text{ and } \bar{G}.$$

b. respect in which the multipliers differ relates to their signs. The $\bar{G}$ multiplier, $\frac{1}{1-b}$, is positive, and the $\bar{T}$ multiplier, $-\frac{b}{1-b}$, is negative. The reason for this is the way these variables affect the income-expenditure process. Government expenditure adds directly to the flow of total expenditure. Consequently, $\bar{G}$ has a multiplier with a positive sign; an increase in $\bar{G}$ can be expected to lead to an increase in Y^*. Taxes, however, subtract indirectly from the flow of total expenditure by reducing disposable personal income and, therefore, consumption expenditure. Consequently, $\bar{T}$ has a multiplier with a negative sign; an increase in $\bar{T}$ can be expected to lead to a decrease in Y^*.

c. Another respect in which the multipliers differ relates to their absolute values. The absolute value of the $\bar{G}$ multiplier, $\frac{1}{1-b}$, is greater than the absolute value of the $\bar{T}$ multiplier, $\frac{b}{1-b}$. (Remember b, the marginal propensity to consume, is greater than 0 and less than 1.) The reason for this is that all of an increase in G is added initially to the expenditure flow, while only a fraction -- equal to b, the marginal propensity to consume -- of a decrease in taxes is added initially to the expenditure flow. In each case the ultimate increase in Y^* is equal to $\frac{b}{1-b}$ times this initial increase in expenditure. This implies that the absolute values of the multipliers are $\frac{1}{1-b}$ in the government expenditure case and $\frac{1}{1-b} \times b$, or $\frac{b}{1-b}$, in the tax case.

Example: *If $b = .8$, then the government expenditure multiplier is $\frac{1}{1-.8} = \frac{1}{.2} = 5$, while the tax multiplier is*

$\frac{.8}{1-.8} = \frac{.8}{.2} = -4$. *The multipliers have the opposite sign and have unequal absolute values.*

4.2.2. Equal changes in $\bar{G}$ and $\bar{T}$

a. Since the $\bar{G}$ and $\bar{T}$ multipliers differ in sign, then equal changes in these instrument variables will tend to be partially offsetting. It is not true, however, as might at first be expected, that the effects of an increase in $\bar{G}$ and an increase in $\bar{T}$ will be exactly offsetting. This follows from the fact that these multipliers have different absolute values. Because the $\bar{G}$ multiplier is greater in absolute value than the $\bar{T}$ multiplier, the effect of equal increases in $\bar{G}$ and $\bar{T}$ is to increase Y^*. That is, the increase in Y^* due to the increase in $\bar{G}$ will be only partially offset by the decrease in Y^* due to the increase in $\bar{T}$.

Example: *If $\bar{G}$ and $\bar{T}$ are both increased by 10, and b = .8, the effect of increasing $\bar{G}$ is to raise Y^* by 5 x 10 = 50 and the effect of increasing $\bar{T}$ is to lower Y^* by 4 x 10 = 40. The combined effect is to increase Y^* by 10.*

b. By using the income-expenditure model it is possible to see by how much an equal increase in $\bar{G}$ and $\bar{T}$ will increase Y^*. Using the reduced form equation for Y^* once again, it is possible to obtain the following expression for ΔY^*:

$$\Delta Y^* = \frac{1}{1-b}\,\Delta\bar{G} - \frac{b}{1-b}\,\Delta\bar{T}, \text{ for constant } \bar{T}.$$

If $\bar{G} = \bar{T}$, then by substituting $\bar{G}$ for $\bar{T}$ yields:

$$\Delta Y^* = \frac{1}{1-b}\,\Delta\bar{G} - \frac{b}{1-b}\,\Delta\bar{G}$$

$$= \frac{1}{1-b} - \left[\frac{b}{1-b}\right]\,\Delta\bar{G}$$

$$= \frac{1-b}{1-b}\,\Delta\bar{G}$$

$$= \Delta\bar{G}.$$

That is, the effect of an equal increase in government spending (G), and taxes (T) on national income (Y^*) is precisely equal to the initial change in taxes and government spending. In other words, the balanced budget multiplier is equal to 1. This result does not depend on any of the "parameters" in the economic system. For example, it does not even depend on the value of the marginal propensity to consume. Thus, the stimulatory effect of an equal increase in government spending and taxes is the same in an economy with a high MPC as in one with a low MPC.

Example: *That the balanced budget multiplier is 1 can be seen in the previous example. An increase in $\bar{G}$ and $\bar{T}$ of 10, with b = .8, led to an increase in Y^* of 10. If b were assumed to be another value, say .75, the result would have been the same. In that case:*

$$\Delta Y^* = \frac{1}{1-.75} \times 10 - \frac{.75}{1-.75} \times 10 = (4 \times 10) - (3 \times 10) = 1$$

c. In sections b and c above, the effect of increasing $\bar{G}$ and $\bar{T}$ equally was analyzed. Obviously, the effect of decreasing $\bar{G}$ and $\bar{T}$ equally will have

the opposite effect, namely, to decrease Y*. As indicated in section 4.2.1, a reduction in $\bar{T}$, with $\bar{G}$ constant, will increase Y*. However, a reduction in $\bar{T}$ with an equal reduction in $\bar{G}$, will decrease Y*.

Example: *It is sometimes argued by politicians that it is only appropriate to "stimulate the economy" (i.e., increase aggregate demand) by decreasing taxes if such a decrease is accompanied by an equal decrease in government expenditure. It follows from the analysis above, however, that such a policy would decrease aggregate demand rather than increase it.*

4.2.3. Implications of fiscal policy for budgetary balance

a. In section 4.1 it was demonstrated that by controlling the level of government expenditure or net taxes it is possible to control the level of aggregate demand. As a result, it is possible to use fiscal policy to influence aggregate demand so as to achieve the preferred point on the Phillips Curve. It was also demonstrated that it is possible to achieve a target Y* by changing $\bar{T}$ or $\bar{G}$. It is also possible to achieve the same Y^*_t by a combination of $\bar{G}$ and $\bar{T}$ changes. This implies that there are many $\bar{G}$ and $\bar{T}$ combinations, for a given $\bar{I}$, which will generate Y^*_t.

b. There is always one $\bar{G}$ and $\bar{T}$ combination which will yield Y^*_t for which $\bar{G}$ and $\bar{T}$ and equal. That is, for a given $\bar{I}$, there is a balanced budget at some level of $\bar{G}$ and $\bar{T}$ which will yield the policy maker's target level of aggregate demand. This can be seen from the reduced form equation for Y* as follows:

$$Y^* = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G} - \frac{b}{1-b}\bar{T}.$$

Set $Y^* = Y^*_t$ and $\bar{G} = \bar{T}$:

$$Y^*_t = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} + \bar{G}.$$

Solve for $\bar{G}$:

$$\bar{G} = Y^*_t - \frac{a}{1-b} - \frac{1}{1-b}\bar{I}.$$

This is the size of the balanced budget which will yield Y^*_t.

Example: *Suppose $a = 50$, $b = .8$, and $\bar{I} = 100$. Suppose $Y_t^* = 1000$. The balanced budget which will yield a $Y^* = 1000$ is given by the equation*

$$\bar{G} = Y_t^* - \frac{a}{1-b} - \frac{1}{1-b}\bar{I}$$
$$= 1000 - \frac{50}{1-.8} - \frac{1}{1-.8} \times 100$$
$$= 1000 - 250 - 500$$
$$= 250$$

That is, if $\bar{G}$ and $\bar{T}$ are set equal to 250, then there will be a balanced budget and aggregate demand will equal the policy maker's target level.

c. The idea that any target level of GNP can be achieved with a balanced budget is an important one, and can be shown graphically. Recall from 4.2.3.b that when $\bar{G} = \bar{T}$, the reduced form equation for Y_t^* becomes

$$Y_t^* = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} + \bar{G}.$$

If investment spending is held constant, the equation above has the form

$$Y_t^* = A + \bar{G}$$

where $A = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} = \frac{a+\bar{I}}{1-b}$

So for a given level of investment spending, the relationship between Y_t^* and $\bar{G}$ is linear in a model which requires that $\bar{G} = \bar{T}$, i.e., which requires that the government have a balanced budget. This is shown in Figure 4.5.

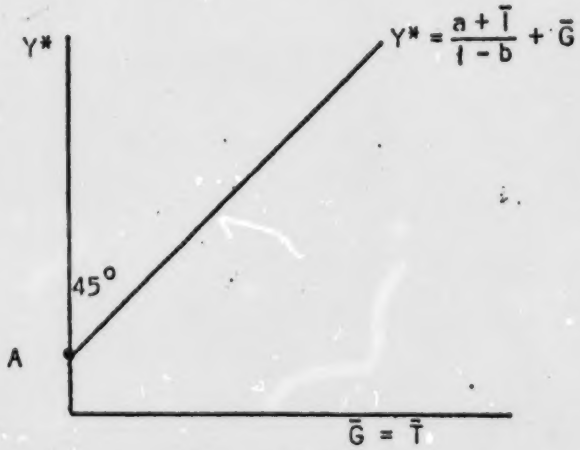


Figure 4.5

Two features about this graph should be noted. First, the vertical intercept A has the value $\frac{a+\bar{I}}{1-b}$. Thus, if businesses decide to undertake more investment spending, the entire line would be shifted upward (like a shift from ℓ_1 to ℓ_2 in Figure 4.6c below). Second, the slope of the line (the coefficient of $\bar{G}$ in the equation) has the value of unity. In other words, if $\bar{G}$ (and therefore $\bar{T}$) is increased by 15, Y* will increase by 15. If $\bar{G}$ and $\bar{T}$ are decreased by 6.7, Y* will decrease by 6.7. This result should have been predicted because of the discussion of the balanced budget multiplier in section 4.2.

d. Given the relationship between balanced government budgets and equilibrium GNP, it is possible to integrate the earlier analysis of the Phillips Curve and the Okun relationship to see how policy makers can:

(1) determine a target level of unemployment by considering the Phillips Curve;

(2) use the Okun relationship to determine the corresponding target level of GNP; and

(3) use the relationship between levels of a balanced budget and levels of GNP to determine how $\bar{G}$ and $\bar{T}$ could be chosen to attain the target level of GNP with a balanced budget.

Figure 4.6 presents the Phillips Curve (Figure 4.6a), the Okun relationship (Figure 4.6b), and the relationship between levels of a balanced budget and corresponding levels of GNP. (Figure 4.6c). Policy makers begin their three-step process in Figure 4.6a by choosing the least undesirable combination of inflation and unemployment at point R_1. This determines the target rate of unemployment, U_1. When this unemployment rate is projected onto Figure 4.6b, the Okun relationship shows a target equilibrium GNP of Y_1^*. Transferring the value Y_1^* over to Figure 4.6c, it is seen that the government should set the levels of both government spending and taxation at G_1 in order to have a GNP of Y_1 (which yields an unemployment rate of U_1) and a balanced budget.

How would this scenario be different if businesses suddenly decided to undertake more investment spending at all levels of GNP? This would shift line ℓ_1 in Figure 4.6c upward to some position such as ℓ_2 because the value of the vertical intercept is now larger. In this new situation, the government is now able to achieve Y_1 and U_1 with smaller

levels of $\bar{G}$ and $\bar{T}$ (G_2) and still have a balanced budget. Ceteris paribus, the more spending done by businesses (and/or households), the lower are the levels of $\bar{G}$ and $\bar{T}$ necessary to maintain a particular level of GNP. Note that more spending by consumers would shift line ℓ_1 upwards in Figure 4.6c, since the intercept term contains the parameter a from the household consumption function.

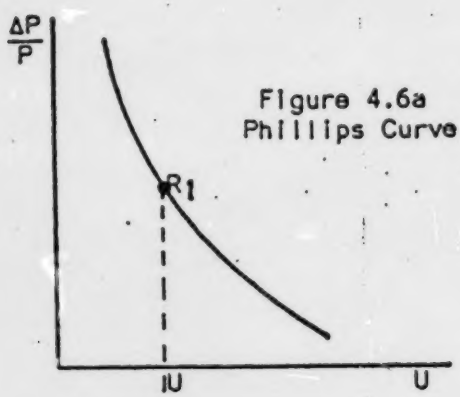
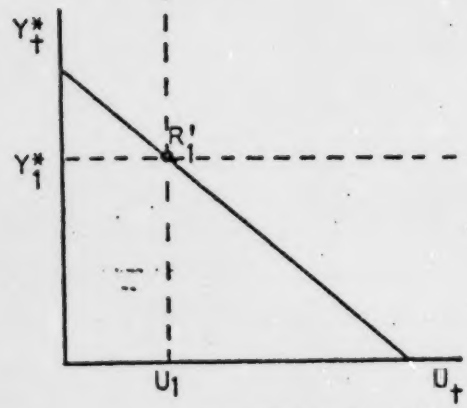
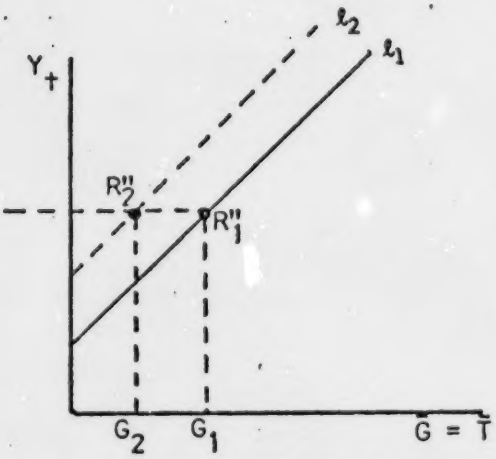


Figure 4.6a
Phillips Curve



Okun Relationship
Figure 4.6b



Balanced Budget - GNP Relation
Figure 4.6c

4.3. Choosing the Size of the Budget Deficit or Surplus

4.3.1. The range of budgets consistent with Y_t^*

a. It has been shown in preceding sections that there are many different $\bar{G}$ and $\bar{T}$ combinations which will yield a given Y_t^*. It has also been shown that one of these combinations will involve a balanced budget. Some of the combinations will involve a budget surplus and the remaining combinations will involve a budget deficit.

Definitions: Budget surplus -- the amount by which $\bar{T}$ exceeds $\bar{G}$.
Budget deficit -- the amount by which $\bar{G}$ exceeds $\bar{T}$.

b. That some fiscal policies which will achieve Y_t^* will involve a budget surplus can be seen in terms of the following argument. Consider the balanced budget that will achieve Y_t^*. Now consider increasing $\bar{G}$ by some amount $\Delta\bar{G}$. By how much must $\bar{T}$ be increased to keep Y^* from changing? Since the absolute value of the $\bar{G}$ multiplier is greater than that of the $\bar{T}$ multiplier, the increase in $\bar{T}$ must be greater than $\Delta\bar{G}$ to keep Y^* from changing. Consequently, budgets with higher levels of $\bar{G}$ than the balanced budget which will achieve Y_t^* must have a budget surplus if they are to yield Y^* equal to Y_t^*.

Example: *Suppose that $\bar{I} = 100$, $\bar{G} = 250$, and $\bar{T} = 250$. Also, suppose that $a = 50$ and $b = .8$. As worked out in a previous example, these assumptions imply that $Y^* = 1000$. Finally, suppose $Y_t^* = 1000$. This means that the equilibrium aggregate demand equals the target aggregate demand with a balanced budget. For this economy, if $\bar{G}$ were higher by 20, how much higher would $\bar{T}$ have to be for Y^* to still be equal to Y_t^*, i.e., 1000? And what would this imply about the size of the budget surplus or deficit? Using the reduced form equation,*

$$Y^* = \frac{a}{1-b} + \frac{1}{1-b}\bar{I} + \frac{1}{1-b}\bar{G} - \frac{b}{1-b}\bar{T}$$

it is possible to find the value of $\bar{T}$ which will yield a $Y^* = 1000$ for $\bar{G} = 270$, as follows:

$$1000 = \frac{50}{1-.8} + \frac{1}{1-.8} \times 100 + \frac{1}{1-.8} \times 270 - \frac{.8}{1-.8} \times \bar{T}$$

$$1000 = 250 + 500 + 1350 - 4 \times \bar{T}$$

$$4\bar{T} = 1100$$

$$\bar{T} = 275$$

In words, $\bar{T}$ would have to be higher by 25 if $\bar{G}$ were higher by 20 in order for Y^* to remain at 1000. That is, for this higher $\bar{G}$, a budget surplus is required to achiev Y^*_t.

c. It can easily be seen, using the same line of argument, that a budget with a lower $\bar{G}$ -- i.e., lower than in the balanced budget which will achieve Y^*_t -- must have a budget deficit if it is also to generate a Y^* equal to Y^*_t. That is, a budget with a lower $\bar{G}$ must have an even greater reduction in $\bar{T}$ -- which implies a larger deficit -- to achieve the same Y^*.

d. It is possible to see that there is a range of budget deficits and surpluses consistent with a given Y^* in terms of Figure 4.7. $\bar{G}$ is measured along the vertical axis and $\bar{T}$ along the horizontal axis. The 45° line from the origin represents all the combinations of $\bar{G}$ and $\bar{T}$ which will yield a balanced budget. Any budget below the 45° line has a surplus and any budget above has a deficit. Only one of these balanced budgets (say A) is consistent with a given Y^*_t. A larger balanced (e.g., B) budget will yield a $Y^* > Y^*_t$, and a smaller balanced budget (e.g., C) will yield a $Y < Y^*_t$. This is a consequence of the balanced budget multiplier: an equal increase in $\bar{G}$ and $\bar{T}$ leads to an increase in Y^* of the same amount.

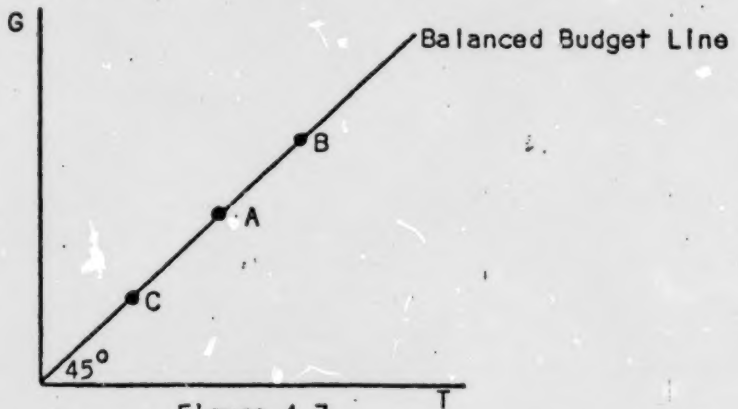


Figure 4.7

e. All of the budgets which yield a given Y_t^* can be portrayed on the same diagram by the line labelled Y_t^*, as shown in Figure 4.8. This line intersects the balanced budget line at A, because A is the single balanced budget which yields the target equilibrium income, i. e., $Y^* = Y_t^*$. But the Y_t^* line is flatter than the balanced budget line. This is the result of the reasoning given in sections b and c above. Consider an increase in $\bar{G}$ from point A. In order to keep Y^* constant it is necessary for $\bar{T}$ to increase by more than $\bar{G}$. Consequently, budget with a higher $\bar{G}$ that yield a $Y^* = Y_t^*$ must have a surplus and will be on a line which lies below the balanced budget line to the right of A. Similarly, budgets with lower $\bar{G}$ that also yield a $Y^* = Y_t^*$ must have a budget deficit and will be an a line which lies above the balanced budget line to the left of A. Consequently, the Y_t^* line is flatter than the balanced budget line.

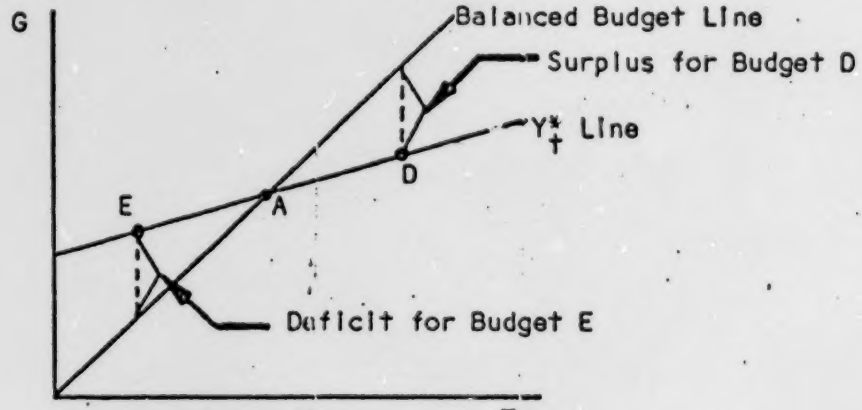


Figure 4.8

f. In Figure 4.8, consider the budget D. This budget lies on the Y_t^* line so it will yield a $Y^* = Y_t^*$. It has a surplus equal to the vertical distance between the balanced budget line and the Y^* line at D. Budget E also yields a $Y^* = Y_t^*$, but it has a deficit equal to the vertical distance between the Y_t^* line at E and the balanced budget line.

4.3.2. Why not always choose the balanced budget which achieves Y_t^*?

a. We have seen that whatever Y_t^* the policy maker might choose, there is always a balanced budget which will generate a Y^* equal to that target level. Not every balanced budget will achieve Y_t^*. Only one particular balanced budget, the one with the appropriate level of $\bar{G}$ and $\bar{T}$, will generate the target level of Y^*.

b. Many people believe, for reasons to be discussed later, that it is better for the government to have a balanced budget than to have a budget surplus or deficit. Given this belief and given that there is a balanced budget which will achieve Y^*_f, why shouldn't policy makers always choose that balanced budget as their fiscal policy?

c. If the policy maker's objectives were only the attainment of both Y^*_f and a balanced budget, then the correct policy might be to always choose that balanced budget which achieves Y^*_f. If, however, there are other objectives of fiscal policy with which policy makers are concerned, then these objectives may make the balanced budget which achieves Y^*_f less preferable than some other budget, which may have either a deficit or surplus and which also achieves Y^*_f.

4.3.3. Budgetary size as an objective of fiscal policy

a. The government does not make expenditure for goods and services primarily to achieve a desired level of Y*. The principal reason for government expenditure is to provide for consumption and investment which can best be made collectively by the government on behalf of households. Such expenditure provides for national defense, police and fire protection, public education, the judicial system, public health services, etc.

b. Assuming Y^*_f is in fact achieved, there will be some level of $\bar{G}$ which will be an optimal allocation of income to collective consumption and investment expenditure, given society's preferences, as expressed through the political system. Any more or less than that level of $\bar{G}$ will result in an imbalance between public and private expenditure according to those politically determined preferences.

c. Since society cares how its GNP is divided between public and private expenditures, policy makers must choose a fiscal policy which takes into account this objective. That is, policy makers must not only try to achieve a Y* consistent with society's preferences regarding the choice between unemployment and inflation rate combinations, but they must also formulate a budget which is consistent with society's preferences regarding the allocation of total GNP between public and private expenditures.

d. Since the $\bar{G}$ which provides for an optimal allocation between public and private expenditures will not generally be the $\bar{G}$ which, with a balanced budget, will achieve Y^*_f, it will usually not be possible to formulate a fiscal policy which will provide for all three of the following:

a. a Y* equal to Y^*_t;

b. an optimal division of Y* between public and private expenditure;

c. a balanced budget.

e. In order to achieve both a. and b. above it will usually be necessary to forego a balanced budget. Sometimes it will be necessary to have a budget deficit, and other times a budget surplus will be in order if both of those objectives are to be achieved through the use of fiscal policy.

f. The problem of choosing among alternative budgets to achieve conflicting objectives can be seen in terms of Figure 4.9 which shows the balanced budget line and the flatter Y^*_t line. If the government has a target level of G which achieves its goal with respect to the allocation between public and private expenditures, that goal can be represented by $\bar{G}_t$ in the diagram. If the government insists on $\bar{G}_t$, then it cannot achieve both a balanced budget and Y^*_t. The balanced budget with $\bar{G} = \bar{G}_t$ is given by L, while the budget which yields a $Y^* = Y^*_t$ is given by K. In order to have both Y^*_t and a balanced budget, the government must choose budget A. But this involves a $\bar{G} > \bar{G}_t$. Given the government's preferences, one of the three objectives must be sacrificed.

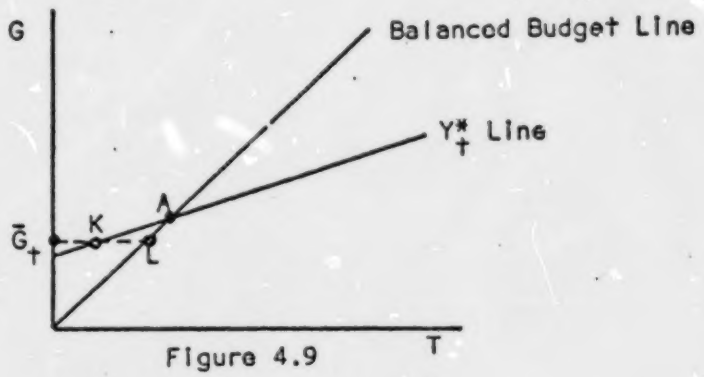


Figure 4.9

4.3.4. Do budget deficits cause inflation?

a. If policy makers choose to sacrifice the goal of budgetary balance in order to achieve its other objectives, what will be the consequences? The answer to this question may also provide insight into whether the desire for budgetary balance has any rational basis. It is not possible

at this stage to answer this question fully. A more complete answer will come later in the course. At this point, however, a partial answer can be obtained by considering one argument against budgetary imbalance.

b. This argument is that a budget deficit will cause inflation. What is the validity of this argument in terms of the amended model? The model is determined by the levels of aggregate demand relative to potential GNP. Given the level of $\bar{G}$, the lower $\bar{T}$ is and, therefore, the larger the deficit is, the greater will be aggregate demand. Since more of all goods and services are demanded, prices will rise. Consequently, it is true that the larger the deficit, the greater will be the rate of inflation. It is in this sense that this argument has some truth.

c. However, given a Phillips Curve, there will be a preferred point on it which may involve a positive rate of inflation. To achieve that point may require a budget deficit, in which case an attempt to avoid the inflation by balancing the budget will result in less inflation and more unemployment than policy makers have determined to be consistent with the preferences of society on whose behalf they are acting. In other words, if the best feasible alternative involves a particular level of $\bar{G}$ and a particular positive rate of inflation, an attempt to avoid inflation (and thereby, select a less preferred alternative by reducing the budget deficit) would be inconsistent with the preferences of society with regard to alternative unemployment-inflation rate combinations.

d. Put somewhat differently, given a negatively-sloped Phillips Curve and given $\bar{G}$, a higher deficit (i.e., lower taxes) will yield a higher Y^* and, consequently, a higher rate of inflation and a lower rate of unemployment. It is not possible, given these assumptions, to reduce inflation by reducing the deficit without also increasing unemployment. To the extent that society cares about unemployment as well as inflation, policy makers are forced to consider the effects of the budget on both target variables and they may find that a budget which generates some positive inflation preferable to one that generates zero inflation but higher unemployment.

e. In the foregoing discussion it should be understood that it is not the size of the deficit itself, but rather its effect on the level of Y^*,

which determines the rate of inflation. Given the position of the Phillips Curve, the parameters a and b, and the level of $\bar{I}$, the following statements are true for the reasons given:

a. The same deficit with a higher level of $\bar{G}$ will cause more inflation. This is because a budget with the same deficit, but with higher $\bar{G}$, generates a higher Y^*.

b. There exists some balanced budget which will generate the same rate of inflation as any particular budget with a budget deficit. This is because there is always some balanced budget which will generate the same Y^* as another unbalanced budget.

4.4. Endogenous Taxes

4.4.1. The tax function

a. Thus far in the analysis it has been assumed that T was an exogenous variable determined by the government in formulating its fiscal policy. In reality, the government does not determine T directly. Rather it establishes and administers tax laws which state, among other things, the percent of sales, income, etc., households and businesses must pay in the form of taxes.

b. For the purpose of macroeconomic analysis, it is the aggregate of taxes, T, which is of interest. The income-expenditure model must be modified to take into account how T depends on the tax rates the government sets and on other variables in the model. That is, the model must include a tax function which gives total net taxes as a function of tax parameters, as determined by the tax laws, and other variables in the model.

c. Like the other relationships in the model, the tax function can at best be an approximation to the real world. The following equation, although very simple, provides a fairly accurate representation of how T actually behaves:

$$T = t_0 + t_1 Y.$$

It says that total net taxes are equal to a parameter, t_0, plus another parameter, t_1, times national income.

d. The parameter t_1 is the aggregate marginal net tax rate. It determines how total taxes minus total transfer payments change as GNP changes.

It captures the aggregate effects of existing tax rates on income and sales and existing transfer payment programs whose benefits are related to income. As the government changes tax and benefit rates, the parameter t_1 changes. Of course, an increase in tax rates or a decrease in benefit rates will increase t_1.

e. For the U. S. economy t_0 appears to be negative. Since T represents net taxes, i.e., taxes minus transfer payments, it is not surprising that $t_0 < 0$. As national income becomes smaller, i.e., as it approaches zero, taxes decline and transfer payments, such as unemployment compensation and welfare payments, increase, and if Y became low enough, net taxes would become negative. It is unlikely, however, that Y would ever fall low enough to make T negative. The parameter t_0 is the level of net taxes which theoretically would prevail if Y were zero. Any increase in taxes or decrease in benefits which is unrelated to Y will make t_0 larger, i.e., less negative. A changes in exemptions -- income which is exempt from taxes -- would change t_0. An increase in exemptions will make t_0 smaller, i.e., more negative.

Example: *Suppose that t_0 is -200 and t_1 is .25. This implies that the net tax rate on income is 25 percent. Table 4.1 shows net taxes (T) for different levels of national income (Y).*

Y	*T*
0	*-200*
200	*-150*
400	*-100*
600	*-50*
800	*0*
1000	*50*
1200	*100*
1400	*200*

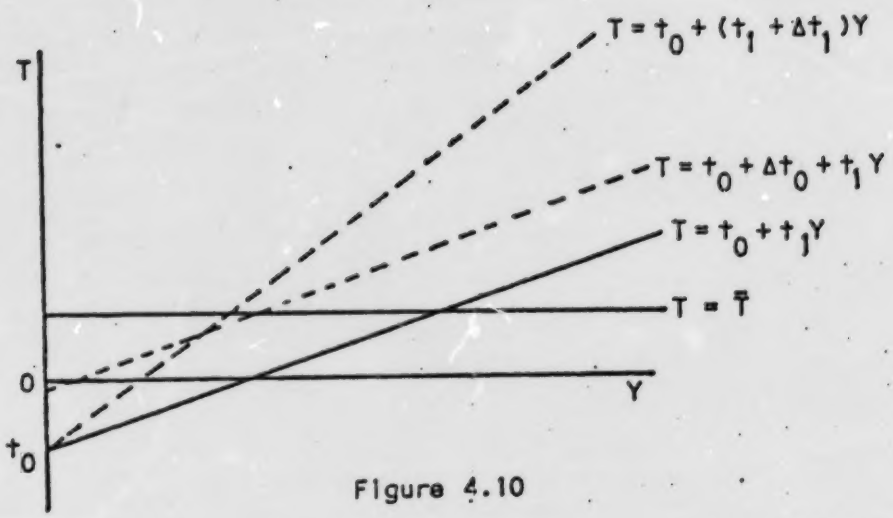


Figure 4.10

f. The tax function can be seen in diagrammatic terms in Figure 4.10 The vertical intercept corresponds to the parameter t_0. The slope of the tax function corresponds to the parameter t_1. An increase in t_1 would take the form of a counter-clockwise rotation in the tax function around the point of the vertical intercept. An increase in t_0 would appear as an upward parallel shift in the tax function. The horizontal line at $\bar{T}$ represents the tax function implicit in the assumption that T is exogenous.

4.4.2. Solving the model with endogenous T

a. The income-expenditure model for which the assumption that T is exogenous is replaced with a tax function like that presented in section 4.4.1 will have the following structural form:

(1) $C = a + bY_d$

(2a) $Y_d = Y - T$

(2b) $T = t_0 + t_1 Y$

(3) $E = C + \bar{I} + \bar{G}$

(4) $Y = E$

parameters: a, t_0, t_1

endogenous variables: C, E, Y, Y_d, T

exogenous variables: $\bar{I}$, $\bar{G}$

b. The reduced form equation for Y* can be obtained by substituting T from equation (2b) for T in equation (2a), as follows:

$$Y_d = Y - t_0 - t_1 Y;$$

then substituting this expression for Y_d in equation (1), as follows:

$$C = a + b(Y - t_0 - t_1 Y);$$

then substituting this expression for C in equation (3), as follows:

$$E = a + b(Y - t_0 - t_1 Y) + \bar{I} + \bar{G};$$

then substituting this expression for E in equation (4) as follows:

$$Y = a + b(Y - t_0 - t_1 Y) + \bar{I} + \bar{G};$$

and, finally, solving for Y in terms of only exogenous variables and parameters, as follows:

$$(5a) \quad Y^* = \frac{a}{1-b(1-t_1)} - \frac{b}{1-b(1-t_1)} t_0 + \frac{1}{1-b(1-t_1)} \bar{I} + \frac{1}{1-b(1-t_1)} \bar{G}$$

c. The new reduced form equation (5a) gives equilibrium GNP (Y^*) as a function of the consumption function parameters a and b, the tax parameters t_0 and t_1, and the exogenous variables $\bar{I}$ and $\bar{G}$. When an economy has an endogenous tax function, fiscal policy tools therefore include: (1) the level of government spending, $\bar{G}$; (2) the level of that portion of tax collections which is independent of the level of national income, t_0; and (3) the marginal net tax rate, t_1, which relates changes in total tax collections to changes in GNP.

d. An endogenous tax function affects the determination of equilibrium income in two important ways. First, a change in the tax parameter t_0 will cause a multiplied change in equilibrium GNP in much the same way that a change in $\bar{G}$ or $\bar{I}$ does, because a change in t_0 produces a change in Y_d, and therefore a change in C. Secondly, because the tax parameter appears in the coefficient of each term in the new reduced form equation for Y^* (5a), any change in t_1 will alter the degree to which a change in $\bar{G}$, $\bar{I}$, or t_0 changes Y^*. In other words, the values of the multipliers associated with changes in $\bar{G}$, $\bar{I}$, or t_0 depend upon t_1. Each of these points will now be examined in more detail.

e. Consider the effect of a change in the tax parameter t_0 on equilibrium GNP. The coefficient of t_0 in the reduced form equation is $-\frac{b}{1-b(1-t_1)}$, so an increase in t_0 will lead to a decrease in Y^*.

Example: *If $b = .8$ and $t_1 = .25$, then the multiplier for t_0 is $-\frac{.8}{1 - .8(1 - .25)} = -\frac{.8}{.4} = -2$. In this case, an increase in t_0 of 10 would lead to a decrease in Y^* of 20.*

f. It has been pointed out in section d above that the tax parameter t_1 appears in the reduced form coefficients of all of the exogenous variable in equation (5a). For that reason, whenever t_1 changes, so does the effect that a particular change in $\bar{G}$ or $\bar{I}$ or t_0 will have on Y^*. In

other words, whenever t_1 changes, so do the values of all of the multipliers. Because t_1 appears in the denominator of the reduced form coefficients (i.e., multipliers), as t_1 gets larger the multipliers will get smaller, and conversely. That is, the stimulatory effect of an increase in spending on aggregate income and employment is less the larger the fraction of income increases collected as taxes. This is because with larger taxes, increments of spending are increasingl withdrawn from the income stream in the form of taxes.

g. The existence of a tax structure with a positive aggregate marginal net tax rate, as opposed to exogenous taxes with a zero marginal net tax rate, implies a smaller multiplier effect of autonomous changes in exogenous expenditure, such as a change in $\bar{I}$. That is, with such a tax structure a given change in $\bar{I}$ will produce a smaller change in Y^* than would be the case where T is exogenous. For this reason, the tax-transfer system provides the economy with a built-in stabilizer. In the absence of any conscious stabilizing action by the government, there will be an automatic partially offsetting change in net taxes in response to an autonomous change in expenditure which will reduce the size of the effect of an expenditure change on Y^*.

Example 1: *In what way does it make sense to say that the impact on equilibrium GNP of an increase in, say, investment spending should depend upon the form of the government's taxation function? Consider what t_1 actually represents. This "marginal net tax rate" shows what fraction of every additional dollar of GNP the government will withdraw from the spending stream in the form of tax collections. The concept of the multiplier depends upon the fact that an initial injection of spending makes several trips around the circular flow of goods and services in the economy. Each time additional money ends up in the pockets of a household, part of that additional income will itself become another addition to total spending. (Exactly what fraction of an income increase that gets re-spent depends upon the value of the marginal propensity to consume, b.) The parameter t_1 represents the rate at which the government*

siphons dollars out of the spending stream. The faster the government siphons money off (i.e., the larger is t_1), the smaller will be the ultimate or multiplied effect of an initial increase in some type of exogenous spending. This is true regardless of whether we are talking about the effectiveness of a change in $\bar{I}$, a change in $\bar{G}$, or a change in C caused by a change in t_0.

Example 2: *Suppose two economies are initially at full employment with Y = 2000. Imagine that the two countries are identical in every respect except for their tax function. In country A, the tax function is:*

(A) $T = -200 + .20\ Y.$

In country B, the tax function is:

(B) $T = -400 + .30\ Y.$

Total net taxes are the same in the two countries: T = 200.

If b = .8 in the two countries, then the multipliers are $\frac{1}{1-(.8)(.8)} = 2.78$ *in A and* $\frac{1}{1-(.8)(.7)} = 2.27$ *in B.*

If $\bar{I}$ dropped by 10, Y would fall by 27.8 in A, but only 22.7 in B. The difference, of course, is that the higher tax rate in B implies a more powerful built-in stabilizer.

h. From discussion of fiscal policy up to this point, one might obtain the impression that fiscal policy can be used to stablize the level of GNP only when policy makers take actions relating to G and T. This type of behavior is known as discretionary fiscal policy.

Definition: Discretionary fiscal policy -- Changes in $\bar{G}$, t_0, and/or t_1 made at the discretion, or free choice, of policy makers, as opposed to automatic changes in T which occur whenever Y* changes.

However, when an economy has a taxation function which is related to levels of GNP, then the fiscal system also has inherent automatic stabilizing properties. Whether or not policy makers elect to implement discretionary fiscal policy, the fiscal system is automatically

attentuating fluctuations in the level of GNP.

Example: *Why does the fact that tax collections are related to GNP mean that an economy has this* built-in stabilizer? *Because the amount of money which the government withdraws from the income stream is automatically adjusted as the level of GNP rises and falls. If a sudden surge in consumer spending drives Y* and prices upward, total tax collections, T, will automatically increase. This increase in withdrawals from the income stream will exert counter-cyclical downward pressure on Y* and prices. Alternatively, if anticipation of a future world crisis causes businesses to drastically decrease investment spending, tax collections automatically decrease as Y* begins to fall, thus helping to avert (or attentuate the magnitude of) a possible recession. In addition to making the values of the multipliers smaller, an endogenous tax function also acts as an important built-in stabilizer for the economy.*

4.4.3. Endogenous budget deficit

a. Because government sets its tax policy by determining tax rates, it does not directly control the level of total net taxes, T. As can be seen in terms of the aggregate tax function,

$$T = t_0 + t_1 Y.$$

T* (the amount of actual tax revenues when the economy is in equilibrium) will depend on the tax parameters, which the government does control through the tax laws, and also on Y*, which in turn depends on other parameters in the model and the exogenous variables.

b. The reduced form equation for T* can be found by substituting for Y in the tax function the reduced form equation for Y*, as follows:

$$\begin{aligned} T^* &= t_0 + t_1 Y^* \\ &= t_0 + t_1 \left[\frac{a + bt_0 + \bar{G} + \bar{T}}{1 - b(1 - t_1)} \right] \\ &= t_0 + \frac{at_1 + bt_0 t_1}{1 - b(1 - t_1)} + \frac{t_1}{1 - b(1 - t_1)} (\bar{I} + \bar{G}). \end{aligned}$$

In words, an autonomous increase in either $\bar{I}$ or $\bar{G}$ will lead to an increase in T* equal to $\frac{t_1}{1-b(1-t_1)}$ times the increase in expenditure.

c. Once the government sets its tax policy, the value of T* will depend on the values of the exogenous variables, e.g., $\bar{I}$. If $\bar{I}$ happened to be high, then Y* and T* will tend to be high. If $\bar{I}$ is low, then Y* and T* will tend to be low. This fact is a reflection of the tax structure's role as a built-in stabilizer. When $\bar{I}$ declines T is automatically reduced, which partially offsets the effect on Y* of the decline in $\bar{I}$.

d. Since T is an endogenous variable, the budget deficit, $\bar{G} - T$, is also an endogenous variable. That is, the equilibrium value of the deficit $\bar{G} - T^*$, will depend on the model's parameters and the exogenous variables just as T* does. For a given $\bar{G}$, the lower Y* and, consequently, T*, the higher will be the budget deficit, $\bar{G} - T^*$. It is for this reason that the budget deficit tends to be large when the economy has high unemployment, i.e., when Y* is low.

Example: *Consider the following data for the U.S. economy for the periods 1957-58, 1960-61, 1969-71, and 1973-75*

Year	*U*	*G-T*
1957	*4.3*	*-0.7*
1958	*6.8*	*12.5*
1960	*5.5*	*-3.7*
1961	*6.7*	*4.3*
1969	*3.5*	*-8.8*
1970	*4.9*	*10.1*
1971	*5.9*	*18.5*
1973	*4.9*	*-3.5*
1974	*5.6*	*11.5*
1975	*8.5*	*71.2*

In each of these periods unemployment rose as Y fell relative to Y_p. As a result taxes fell, transfer payments increased, and the budget shifted from a small surplus to a large deficit.*

e. While the tax-transfer system serves as a built-in stabilizer, it can only partially offset the effect on Y* of an autonomous change in an

exogenous variable. Consequently, policy makers cannot rely on the automatic changes in net taxes to keep Y* equal to Y^*_t. They must use discretionary changes in $\bar{G}$ and/or the tax parameters to keep Y* on target.

4.4.4. Fiscal drag

a. As Y_f grows over time because of factors like population increases, changes in labor force participation, and technological advances, Y_t is also likely to grow. Under these circumstances it may be necessary to use discretionary fiscal policy to ensure that Y* grows at the same rate as Y_t. This is because it would be most unusual for the growth in $\bar{T}$, the growth in $\bar{G}$ (in order to achieve the desired balance between public and private expenditures), and the growth in T* (which occurs as Y* grows) to all be in just the right amount so as to make Y* increase at the same rate as Y_t. When there is a difference in these growth rates, the government can use discretionary fiscal policy to adjust the growth rate of Y* to be closer to the growth rate of Y_t.

b. The problem of keeping Y* equal to a growing Y^*_t is accentuated by the form of the tax structure. Because t_0 is negative and t_1 is positive as Y grows, the share of Y which the government receives in the form of net taxes will increase. That is, net taxes will grow at a faster rate than Y. This can be seen in Figure 4.11. For Y_0 the share of Y going to T is zero. For Y_1 it is positive. For higher levels, such as Y_2, the ratio of T to Y is even higher.

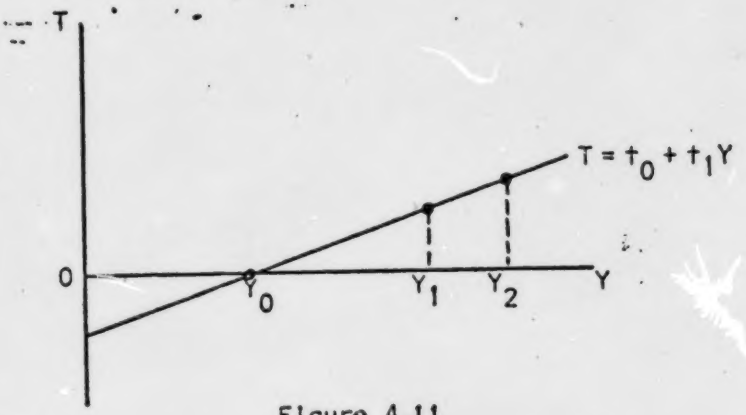


Figure 4.11

c. The fact that taxes increase relative to national income as national income increases means that the economy has a progressive tax structure.

This is a consequence of the widely accepted view, which is incorporated into U. S. tax laws, that people with high incomes should pay a larger share of their income in taxes because they are better able to afford it.

d. Because net taxes tend to increase relative to Y over time for given tax parameters, disposable income, $Y_d = Y - T$, will tend to decrease relative to Y. Consequently, consumption expenditure, which depends on disposable income, will tend to decrease relative to Y. That is, the tax structure will tend to keep one of the components of aggregate demand, and, therefore, aggregate demand itself, from keeping pace with the growth of Y_t. This tendency for the tax structure to keep Y* from growing as fast as Y_t is known as fiscal drag.

e. To counter the effect of fiscal drag will require policy makers to periodically reduce tax parameters. This will serve to shift the tax function down and keep taxes from continually rising relative to Y as Y increases.

4.4.5. The full-employment budget

a. Despite the stabilizing effect of the tax-transfer system, policy makers are still required to formulate discretionary fiscal policy if they wish to use fiscal policy to keep Y* equal to Y^*_t. Specifically, discretionary policy can be used to offset changes in exogenous variables and to keep Y* growing along with Y^*_t over time.

b. Evaluations of the performance of policy makers in using the budget to control Y* frequently use the budget deficit (or surplus) as a measure of the policy makers' actions. Earlier it was explained that failure to take account of the different between the $\bar{G}$ and $\bar{T}$ multipliers made such a use of the budget deficit misleading. The fact that T is an endogenous variable is another reason why using the budget deficit as an indicator of discretionary policy may be misleading. By simply looking at the change in the budget deficit from one year to the next, it is impossible to determine how much of the change is due to automatic tax and transfer changes and how much is due to discretionary changes in $\bar{G}$, t_0, and t_1.

c. The fact that tax revenues automatically fluctuate with changes in GNP suggests that there is a better way to evaluate policy makers' actions than by merely examining the actual current degree of balance in the

government's budget. Instead of examining the current government budget to see if there is a surplus or deficit, one might instead evaluate what the government's deficit or surplus would be if equilibrium income (Y^*) were equal to full-employment income (Y_p). At Y_p, we could therefore estimate the 'full-employment budget' deficit or surplus. Since around 1950, an estimate of this magnitude has typically produced a surplus. Thus, most of the analysis which looks at the government's budget in this way uses the term full-employment surplus (FES). While it is clearly possible to encounter a full employment deficit, this has been rare. In terms of terminology, therefore, we shall refer to the full employment surplus budget, realizing that a deficit situation would simply be represented as a negative value of the FES.

Definition: Full-Employment Surplus -- an estimate of the government's budget balance ($\bar{G} - T$) evaluated at full employment (Y_p) with a given t_0 and $\bar{G}$.

The FES is intended to measure the effect of discretionary fiscal polic on aggregate demand. An increase in the FES would indicate that discretionary polic; is moving in the direction of reducing aggregate demand.

Because in recent times calculations have revealed an FES, discretionary policy has focused on attempts to reduce the size of the full-employment surplus. The Kennedy tax cut was one such example.

Example: *President Kennedy's reduction in the tax* rate *was justified to the Congress using both the terminology and the concept of the FES. While the Kennedy budget at* current *income levels would have yielded a deficit, it was noted that* if *the economy picked up, and income rose, with a given tax rate (t_0) there would be a budget surplus. This in its own right does not mean that full-employment could not be reached, since possibly increased aggregate demand in other sectors (I and C) would be sufficient to offset the dampening effects of*

the full-employment surplus. However, the President did not feel that fiscal policy was sufficiently stimulatory, given the FES, and thus he proposed and implemented a reduction in the tax rate, thereby reducing the estimate of the FES.

d. There are two advantages of the FEB over the ordinary budget surplus or deficit as a measure of policy makers' actions. One advantage is that a change in the FEB reflects changes in $\bar{G}$, t_0, and t_1, but does not reflect changes in Y* as does the ordinary budget surplus. That is, a change in the FEB will reflect discretionary fiscal policy actions but not automatic changes in T. This is because the FEB is the deficit or surplus that would result if Y were equal to Y_p, which is predetermined and therefore fixed in the short run, rather than Y* which varies in the short run and will have an effect on the budget surplus. The only way the FEB can change in the short run is if $\bar{G}$, t_0 and/or t_1 change. Consequently, changes in the FEB will only reflect discretionary fiscal policy action.

Example: *In 1957-58 as the economy went into a recession the ordinary budget surplus fell sharply. The FES, however, increased. The latter indicated that discretionary policy was changing $\bar{G}$, t_0, and t_1 to make Y* fall even more, thereby deepening the recession. The reason this did not appear evident when considering the ordinary surplus is that the fall in Y* caused an automatic reduction in T which masked the inappropriate discretionary policy actions.*

e. The other advantage is that the FEB does reflect the effect of changes in Y_p on the hypothetical full-employment budget. In the absence of any change in $\bar{G}$, t_0, and t_1, the FEB would increase if Y_p increased. This measures the extent of fiscal drag, i.e., the increase in T generated by growth in the economy. Failure of policy makers to offset fiscal drag would, therefore, show up as an increase in the FEB surplus in other words, the FEB serves to measure the effect of discretionary policy on aggregate demand relative to potential GNP.

MACRO UNIT 5

INVESTMENT EXPENDITURE

5.1 Investment in the American Economy
5.2 Investment Expenditure and the Rate of Interest
5.3 Other Determinants of Investment Expenditure

5. INVESTMENT EXPENDITURE

5.1. Investment in the American Economy

5.1.1. The variability of investment expenditure

a. Thus far, in analyzing the determination of aggregate demand it has been assumed that investment expenditure is exogenous. That is, it is assumed that I is determined outside of the model, independently of C, Y, and other variables in the model. This is not the same as assuming that I is always constant, but rather that the changes in I are not explained by the model. In other words, the model explains the consequences, but not the causes, of changes in I.

Example: The reduced form equation for Y,

$$Y^* = \frac{a}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{1}{1-b}\bar{I}$$

can be used to demonstrate the effect on Y* of a change in $\bar{I}$, but it provides no explanation of why, or by how much, I varies.

b. As it has thus far been developed, the income-expenditure model focusses on changes in I as an important cause of changes in Y* and, therefore, U and $\frac{\Delta P}{P}$. The reason for this is that throughout the 20th century investment expenditure has been extremely volatile. Excluding periods of war when G has fluctuated substantially, the component of aggregate demand which has been the most variable has been investment expenditure.

Example: As data for the 1970's demonstrates, the fluctuations in I have been substantially greater than in C, G, or Y.

Year	Level of Expenditure (in 1972 prices)				Percent change from previous year			
	C	I	G	Y	C	I	G	Y
1970	669	155	250	1075	2.1	-7.7	-2.7	-0.3
1971	692	167	249	1107	3.4	7.7	-0.4	3.0
1972	733	188	253	1171	5.9	12.6	1.6	5.7
1973	768	207	253	1235	4.8	10.1	0.0	5.5
1974	759	182	256	1214	-1.2	-12.0	1.2	-1.7
1975	770	138	261	1192	1.5	-24.2	2.0	-1.8
1976	813	172	264	1265	5.6	24.6	1.1	6.2

c. The data presented in the above example are consistent with the idea suggested by the income-expenditure model that changes in I cause changes in Y. Even though I is a much smaller share of Y than either C or G, its more dramatic fluctuations appear to have caused Y to change in the same direction.

Example: The years in which Y decreased, 1970, 1974, and 1975, were years in which I decreased sharply. Similarly, the years in which Y increased were years in which I increased sharply. I might be thought of as the tail that wagged the dog (Y).

d. Because fluctuations in I are of such great importance to changes in the level of economic activity, it is desirable to go beyond the simple income-expenditure models presented so far and to consider what factors determine the level of investment expenditure. In other words, it would be desirable, not only to know how a change in I will affect Y, but also to know what causes changes in I. That is, the understanding of the economy's macroeconomic behavior would be substantially enhanced if the income-expenditure model could be expanded to include I as an endogenous variable.

5.1.2. The nature of investment expenditure

a. Before trying to expand the model to include I as an endogenous variable it is helpful to try to develop a deeper understanding of the nature of investment expenditure and its economic function. As was stated in section 1.2.4, investment expenditure is the purchase of goods which are not consumed in the current period. Such goods are called capital goods. Since capital goods are not consumed in the present, they are available to provide for consumption in the future.

Example: Consider the economy of a farm commune which grows, among other crops, wheat. Part of its current production of wheat will be consumed in the present.

That is, some of the wheat will be milled into flour, which will be baked into bread, which in turn will be eaten. The remainder, however, will be set aside to provide seed for next year's crop. The wheat which is saved for seed is investment, i.e., the accumulation of a capital good. By investing part of this year's output in seed to be used in planting next year's crop, the commune provides for future consumption.

b. Unlike in the simplified commune economy in the preceding example, investment expenditure in the American economy takes many forms. The main types of new capital goods are as follows:

Residential structures -- These include homes, apartment buildings, and mobile homes. New capital in this form provides for future consumption in the form of housing services.

Non-residential structures -- These include factories, office buildings, and stores. New capital in this form is used in the future production of whatever goods and services it has been designed for. A new automobile plant would be used to produce autos in the future, and a new supermarket to produce retail services.

Producers' durable equipment -- This category includes machinery, trucks, and tools. Like non-residential structures, this form of capital goods provides for future consumption by expanding the capacity of its owners to produce goods and services in the future.

Change in inventories -- In addition to buildings, machinery, and the like, producers hold capital in the form of materials that have not yet been used up, goods which are not yet completed, and goods which have been produced but not yet sold. These are called inventories. Producers are constantly using up and replacing items in their inventories of materials, goods in process, and finished goods. When producers holdings of inventories increase,

then there is positive inventory investment. When the stock of inventories decreases, there is negative investment.

Example: In 1976 the composition of gross investment expenditure was as follows:

Capital goods type	Investment expenditures (billions of $, 1972 prices)
Residential structures	47
Non-residential structures	38
Producers' durable equipment	78
Change in business inventories	9
Gross private domestic investment	172

c. It is important in trying to understand the economic role of investment to distinguish clearly between the stock of capital goods and gross investment. Gross investment consists of the new capital goods acquired in the current period. The stock of capital goods consists of all capital goods in existence at the beginning of the period as a result of past gross investment expenditure.

Example: A trucking company will own a considerable amount of capital in the form of trucks. At the beginning of the year it may have 100 trucks, some of which were purchased last year, some the year before, etc. During the year it may acquire 10 new trucks. Its capital stock, therefore, is 100 trucks, while its gross investment is 10 trucks.

d. Related to the distinction between the stock of capital goods and investment is the distinction between gross investment and net investment. At the beginning of a period the economy will have a certain stock of capital goods as a result of previous gross investment. During the year some of that capital stock will wear out due to the passage of time and use in production. This is called depreciation. The amount of capital that will exist at

the beginning of the next period will equal the stock at the beginning of this period less depreciation that occurs during this period plus gross investment during this period. That is, the change in the stock of capital goods from one period to the next equals gross investment less depreciation. This is also called net investment. In other words, gross investment expenditure is the purchase of newly produced capital goods, ignoring any loss in old capital goods due to depreciation, while net investment is the increase in the stock of capital goods taking into account both new capital goods purchased and depreciation of old capital goods.

Example: If the trucking company in the previous example had 6 trucks which had to be junked during the year, then its net investment, or change in capital stock, during the year would be 10 - 6 = 4 trucks. That is, its stock of capital at the beginning of next year would equal 100 + 10 - 6 = 104 trucks.

Example: Gross investment expenditure for the U.S. in 1976 was $241 billion in current prices. Capital consumption allowances, which are the dollar value of depreciation on the stock of capital goods, amounted to $108 billion in current prices. Consequently, net investment expenditure in 1976 -- i.e., the increase in the stock of capital between the beginning of 1976 and the beginning of 1977 -- was $133 billion in current prices.

3. The profit motive for investment expenditure.

a. Investment expenditure is made by businesses for the purpose of expanding their stock of capital goods for use in the production of output. The motive for producing output is to sell it and thereby add to the income, or profit, of the businesses' owners.

Consequently, businesses will undertake investment expenditure only if they expect it to be profitable. Usually, the measure of profitability used in evaluating whether an investment expenditure is worth undertaking is the rate of return on the investment.

Definition: Rate of return - average profit per year (net of depreciation) expressed as a per cent of the amount invested.

Example: Consider an oil company investing in a new oil well which costs $100,000 to drill. Imagine that the well can be pumped dry in one year and that the revenue from selling the oil less the labor and other costs associated with operating the well amounts to $125,000. Thus the net profit over and above the investment expenditure is $25,000 and the rate of return is 25,000 ÷ 100,000 = .25, or 25 per cent.

b. The rate of return (RR) for a capital good lasting one year can be calculated from the following formula:

$$RR = \frac{\text{Revenue} - \text{Operating cost} - I}{I}$$

The numerator is net profit resulting from the investment. This can be seen by considering each term of the numerator. Revenue is simply the receipts from sales of the output produced by the capital good. Operating costs are all non-capital (i.e., labor, materials, etc.) incurred in producing the output. Revenue minus operating cost can be called gross profit because it represents profit before deducting the cost of depreciation. By definition, a capital good lasting just one year depreciates completely during the year. This means that the depreciation cost is equal to the initial cost of the capital good, namely I. Consequently, Revenue - Operating Cost - I is the net profit for a capital good lasting one year. By dividing net profit by the cost of the in-

vestment, the result is the rate of return on the investment.

c. The formula for the rate of return on a one year capital good,

$$RR = \frac{\text{Revenue - Operating cost - I}}{\text{I}},$$

is often written in a different form. By multiplying both sides of the equation by I and then substracting I from both sides results in the following equation:

$$I + RR \times I = \text{Revenue - Operating costs}$$

By factoring out I from the left hand side and dividing both sides by I + RR the following formula is derived:

$$I = \frac{\text{Revenue - Operating costs}}{1 + RR}$$

Either formula can be used to calculate the rate of return for a one year capital good given information on I, revenue, and operating cost.

d. The term 1 + RR in the denominator of the previous formula is sometimes call a discount factor. An income payment to be received a year hence divided by the discount factor is called the present value of the payment. Since revenue less operations cost is gross profit, the formula for the rate of return can be rewritten as:

$$I = \frac{\text{gross profit}}{1 + RR}$$

In words, the rate of return is that rate which makes the present value of the gross profits from a capital good equal to the cost of acquiring it.

Example: In the previous example in which an investment expenditure of $100,000 to drill an oil well returned $125,000 in revenue after deducting operating costs in one year, the gross profit was $125,000, the discount factor was 1.25 and the rate of return was .25. In terms of the rate of return formula,

$$I = \frac{\text{Gross Profit}}{1 + RR}$$

$$100{,}000 = \frac{125{,}000}{1 + RR}$$

$$(1 + RR)100{,}000 = 125{,}000$$

$$RR = .25$$

That is, .25 is the rate of return which makes the present value of gross profit equal to the cost of the capital good.

e. When a capital good lasts for two years it is more complicated to calculate the rate of return. This is because part of the gross profit from the investment is returned in the first year and the remainder is returned in the second year. The part that is returned in the second year covers (i) repayment of part of the initial expenditure, (ii) profit earned on that part of the expenditure for two years, plus (iii) profit earned in the second year from that part of the profit earned in the first year but not returned in the first year. Without deriving it, the formula for calculating the rate of return on an investment in a capital good which lasts for two years is as follows:

$$I = \frac{\text{gross profit in year 1}}{1 + RR} + \frac{\text{gross profit in year 2}}{(1 + RR)^2}$$

That is, the rate of return is the value for RR which equates the present value of gross profits in the two years of the capital goods' life to the cost of the investment.

Example: Suppose another oil well is drilled which also costs $100,000 but which will generate gross profits of $55,000 in the first year and $60,500 in the second year. Then

$$100{,}00 = \frac{55{,}000}{1 + RR} + \frac{60{,}500}{(1 + RR)^2}$$

$$100{,}000 = \frac{55{,}000}{1.10} + \frac{60{,}500}{(1.10)^2}$$

$$= 50{,}000 + 50{,}000$$

That is, the rate of return on this investment is 10 per cent.

f. Again without deriving it, the rate of return formula can be generalized for any number of years duration of the capital goods purchased. For a capital good lasting N years the formula is

$$I = \frac{\text{gross profit year 1}}{1 + RR} + \frac{\text{gross profit year 2}}{(1 + RR)^2} + \ldots$$

$$+ \frac{\text{gross profits year N}}{(1 + RR)^N}$$

But, whether the capital good lasts one year or N years, the higher rate of return on the investment -- that is, the more profitable the investment is -- the more attractive it will be to the business deciding whether to make the expenditure.

2. Investment expenditure and the rate of interest

2.1. The rate of interest

a. In order for an investment to be worth undertaking by a business it is not sufficient simply for the rate of return to be positive. It is necessary that the rate of return be high enough to make households (or financial institutions) willing to provide the business with the funds necessary to finance the investment expenditure. A business can obtain funds for investment either from its owners or by borrowing from others. Either way, the supplier of funds will expect to earn as much income in return for supplying funds to that business as they can from any other business. In the absence of a sufficiently large positive return, the suppliers of funds would prefer to use their saving in some other way.

b. The owners of a business can supply new funds to it in two ways: (i) by buying new shares of stock sold by the business, and (ii) by leaving some of the profit on their existing equity in the

business in the form of business retained earnings rather than taking it out of the firm in the form of dividends. The business will be able to sell new shares of stock or persuade owners to retain part of their profit in the business only if the owners can expect to earn a sufficiently large profit on the investment undertaken with their funds to make that use of their funds at least as attractive as the alternative available uses.

Example: Suppose a business can earn a rate of return on an investment of 5 per cent. The owners of the firm can expect, therefore, that if they leave enough of the current profits in the business to enable the business to undertake the investment they will earn 5 per cent on their funds in the form of higher future profits. If, however, they can earn a 10 per cent rate of return on those funds by investing in a different firm it would not be to their advantage to leave those funds in the first business. They would be better off by taking their funds out of the business and investing in the second business.

c. A business can obtain funds from households other than its owners by borrowing from them. This is accomplished by selling bonds which are promises to repay the amount borrowed (principal) plus a certain income over and above principal (interest). The owners of the business will not want want the firm to sell bonds to lenders unless the investment undertaken with the funds is expected to yield enough profit to more than pay the interest on the bonds.

Example: Suppose that a business can earn a rate of return on an investment of 5 per cent and that it can borrow funds at 6 per cent. If it were to undertake the investment by borrowing the funds, then its profits would go up by less than its obligations to pay

interest. This would have the result of actually reducing the profits available to its owners after interest has been paid, even though the investment has a positive rate of return.

d. The minimum acceptable rate of return on an investment is that rate of return at which it would just be able to obtain the funds necessary to undertake the investment. For the sake of simplicity the business is usually thought of as borrowing the funds by selling bonds to lenders. Under this simplifying assumption the minimum acceptable rate of return on an investment is the rate of interest it must pay on the bonds it sells to lenders. A business will not consider undertaking an investment expenditure unless it can be expected to yield a rate of return that is at least as great as the rate of interest. If the rate of return on the investment just equals the rate of interest on the bonds issued to finance the investment, then the investment will neither add to nor subtract from the profit available to the owners of the business. If the rate of return is greater than the rate of interest, then the profit of the owners will increase by undertaking the investment. If the rate of return is less than the rate of interest, then it will be necessary to pay the interest out of the profit earned by the owners on other investments.

Definition: Rate of interest — the percent per year of an amount borrowed which must be paid to a lender over and above the repayment of principal.

Example: If a business borrows $100,000 for one year at a rate of interest of 7 per cent, at the end of the year it must repay the lender $107,000, $100,000 of which is repayment of principal and $7,000 of which is payment of interest (i.e., 7 per cent of $100,00). If the business can earn 8 per cent on a $100,000 investment in a one year capital good, it would be worthwhile undertaking the project. By the end of

the year the investment will yield $108,000. If it finances the project by borrowing the money, even after the payment of the $107,000 in principal and interest to lenders there will be $1,000 left for the owners of the firm in the form of profit after interest.

e. Even when an investment expenditure is financed by funds contributed by the owners, its rate of return must be at least as great as the rate of interest in order to be worth undertaking. If the rate of return is less than the rate of interest prevailing in the market, then the owners would be better off by using their funds to lend to some other business. In this way they could earn more in interest than they could in profit by having the firm they own use their funds to undertake the investment.

5.2.2 The equilibrium level of investment expenditure.

a. Given (i) that businesses undertake investment to earn profits for their owners, and (ii) that in order to be worthwhile investment must yield sufficient profits such that the rate of return is greater than the rate of interest, it follows that the investment expenditure that the aggregate of all businesses would like to make in any period is equal to the sum of all those investment expenditures for which the rate of return exceeds the rate of interest.

b. In any one period the existing investment opportunities will have a range of rates of return: Some will have high, others low, rates of return. If these investment projects were ranked by their rates of return -- the highest first, the next highest second, etc. -- a schedule could be constructed showing the quantity of investment with a rate of return falling into successively lower intervals.

Example: The amounts of investment for different rates of return might appear as follows.

Investment expenditure (billions of dollars)	Rate of return (per cent)
50	> 10
10	9.01 - 10.00
12	8.01 - 9.00
15	7.01 - 8.00
20	6.01 - 7.00
22	5.01 - 6.00

c. Which investment projects will be undertaken will depend on the rate of interest. All those projects for which the rate of return exceeds the rate of interest will add to the profit available to owners of businesses and will therefore be undertaken.

Example: In the schedule given above, if the rate of interest were 7 per cent all the projects yielding rates of return of 8, 9, and 10 per cent or greater will be undertaken if businesses are acting to maximize profits available to their owners.

d. The total amount of investment expenditure will, of course, also depend on the rate of interest. The data on investment expenditure and rates of return can be expressed in a manner which shows the total amount of investment expenditure for which the rate of return exceeds different levels. This will be called the rate of return schedule. The amount of investment expenditure that will be made in any period will be that amount of investment which has a rate of return greater than the rate of interest.

Example: The schedule from the previous example can be re-written in a form which shows the amount of expenditure which has a rate of return in excess of the levels indicated as follows:

Investment expenditure (billions of dollars)	Rate of return
50	> 10
60	> 9
72	> 8
87	> 7
107	> 6
129	> 5

The amount in each category is obtained by adding up the appropriate amounts of investment expenditure from the previous table. For example, the investment with a rate of return greater than 8 per cent is the amount with a rate of return greater than 10% (50) plus the amount with a rate of return in the interval 9.01 - 10.00% (10) plus the amount with a rate of return in the interval 8.01 - 9.00% (12). If the rate of interest is 8 per cent, then the level of investment expenditure will be $72 billion because there are projects costing that amount which have a rate of return greater than 8 per cent. If the rate of interest is 6 per cent, then investment expenditure will be $107 billion.

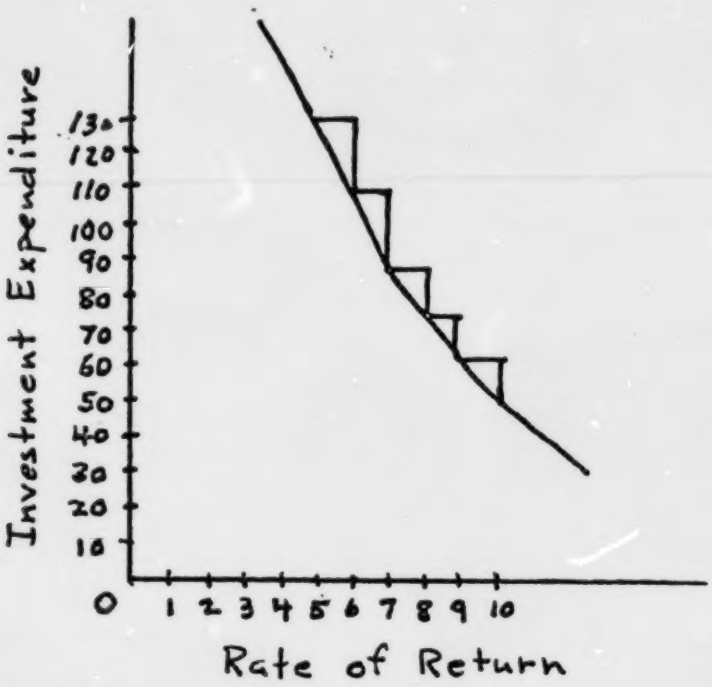
e. Given the rate of return schedule, the lower the rate of interest the greater will be investment expenditure. The reason for this is that in any period the amount of investment expenditure exceeding any given rate of return will be greater, the lower that given rate of return. Consequently, the lower the rate of interest, the more investment projects there will be which have a rate of return greater than the rate of interest.

5.2.4 Diagrammatic and algebraic representation of the determination of investment expenditure.

a. The information contained in the rate of return schedule can be

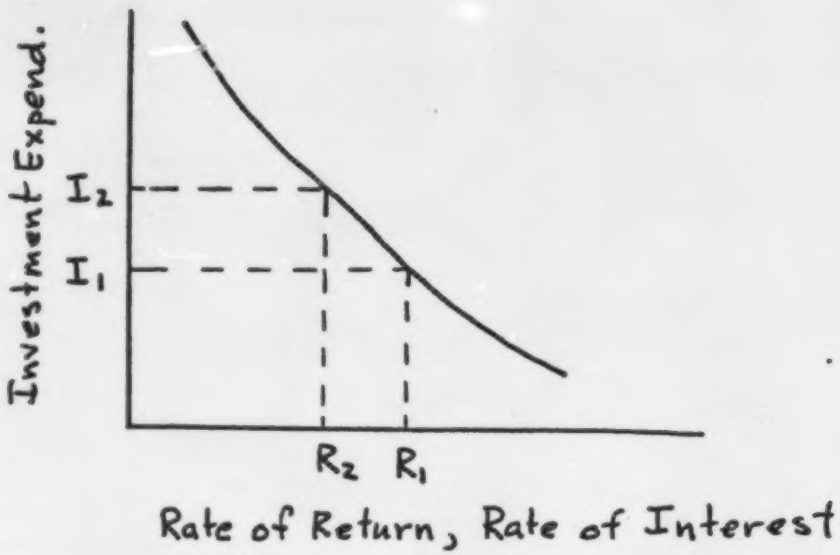
shown in diagrammatic form as in figure 5.6 below. The rate of return is measured along the horizontal axis and investment expenditure is measured along the vertical axis. When the data contained in the rate of return schedule is shown in this diagram it will appear as the step function. If there were more refined data on the range of investment alternatives, the rate of return schedule would appear as the continuous curve.

Figure 5.6



b. Given this curve for any time period, it would be impossible to tell what the level of investment expenditure would be unless the rate of interest were known. In figure 5.7 below the rate of return schedule is shown. If the rate of interest were R_1, then the level of investment expenditure would be I. If the rate of interest were lower, such as R_2, then expenditure would be at the higher level I_2.

Figure 5.7



c. Since profit maximizing businesses can be expected to undertake all those investments for which the rate of return schedule exceeds the rate of interest, it is possible as was done in b above to use the rate of return schedule as a relationship between the amount of investment expenditure and the rate of interest. In terms of Figure 5.7, above, the rate of return schedule shows the amount of investment expenditure (on the vertical axis) which has a rate of return in excess of the rate shown (on the horizontal axis). For a rate of interest R_1 there are I_1 worth of investment projects with a rate of return greater than R_1. For a lower rate of interest R_2 there are more investment projects which have a greater rate of return than the rate of interest.

d. If the simplifying assumption were made that the rate of return curve is linear (i.e., a straight line), then it would be possible to represent the relationship between investment expenditure (I) and the rate of interest (R) by the following equation:

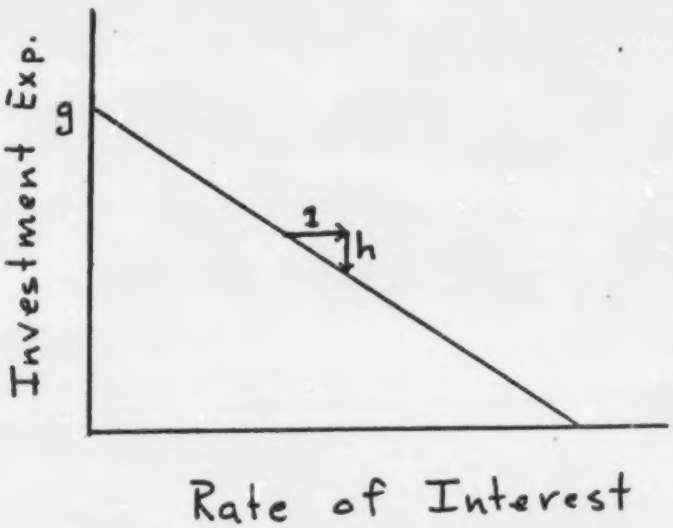
(7) $$I = g + hR$$

This behavioural relationship is called the investment function.

It is simply the algebraic representation of the rate of return function which is used as a relationship between the rate of interest and the level of investment expenditure.

e. The parameter g in equation (7) represents the amount of investment expenditure that would result if the rate of interest were zero. This corresponds to the vertical intercept of the straight line rate of return function in figure 5.8 below. The parameter h is the slope of the linear rate of return function. Since an increase in R results in a decrease in I, h is negative. Given values for the parameters g and h, it is possible to obtain an estimate of what I will be if R is known. As with other parameters of the models used so far, it is the job of research economists to make estimates of their values so policy makers and others can forecast how a change in R would affect I.

Figure 5.8



f. The foregoing analysis has developed the hypothesis that the rate of interest is a determinant of investment expenditure. How responsive I will be to changes in R will depend on the slope of the rate of return schedule or the parameter h of the investment function. This, of course, is an empirical matter than can only be resolved

by analysis of the avilable evidence. While there is widespread agreement that R does influence I to some extent, because of the complexities involved in such research, there does not yet exist widespread agreement within the economics profession as to how powerful an impact a change in R will have on I.

5.2.3. The rate of interest, investment expenditure, and aggregate demand.

a. If the hypothesis that R is a determinant of I is accepted, then it is necessary to modify the income-expenditure model to take into account this structural relationship. It will be recalled that the original income-expenditure model took the following algebraic form:

(1)	$C = a + bY_d$	Endogenous variables:
(2)	$Yd = Y - \bar{T}$	C, Yd, E, Y
(3)	$E = C + \bar{I} + \bar{G}$	Exogenous variables:
(4)	$Y = E$	$\bar{I}$, $\bar{G}$, $\bar{T}$
		Parameters: a, b

(Note that for the sake of simplicity it is assumed in this model that T is an exogenous variable.)

b. If the assumption that I is an exogenous variable is replaced by equation (7), and it is assumed that R is an exogenous variable, then the model will appear as follows:

(1)	$C = a + bY_d$	Endogenous variables:
(2)	$Y_d = Y - \bar{T}$	C, Yd, I, E, Y
(7)	$I = g + h\bar{R}$	Exogenous variables:
(3)	$E = C + I + \bar{G}$	$\bar{G}$, $\bar{T}$, $\bar{R}$
(4)	$Y = E$	Parameters: a, b, g, h

c. The most important implication of this expansion of the model is that aggregate demand will now depend on the rate of interest. The higher the rate of interest, the lower investment expenditure will be (as given by equation (7)) and, consequently, the lower

aggregate demand will be. This can be seen by deriving the reduced form equation for Y* for the expanded model. By substituting (2) into (1) and then (1) and (7) into (3) and finally (3) into (4) yields

$$Y = a + b(Y - \bar{T}) + g + h\bar{R} + \bar{G}$$

$$(1-b)Y = a + g - b\bar{T} + \bar{G} + h\bar{R}$$

$$(5b) \qquad Y^* = \frac{a}{1-b} + \frac{g}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{1-b}\bar{R}$$

The main point to be derived from studying equation (5b) is that Y* now depends on $\bar{R}$. Since h is negative, the reduced form coefficient on $\bar{R}$ is negative which means that an increase in $\bar{R}$ will result in a reduction in Y*.

d. The connection between Y* and R can be seen diagrammatically as well. In figure 5.10 (a) below I is determined by the intersection of the rate of return function and the vertical line indicating the exogenously determined rate of interest. This level of I helps to determine the position of the E line in the income-expenditure diagram 5.10 (b).

Figure 5.10 (a)

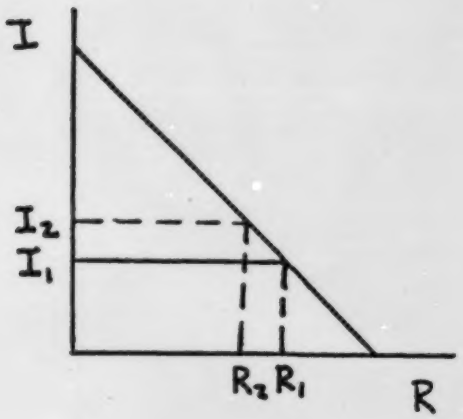
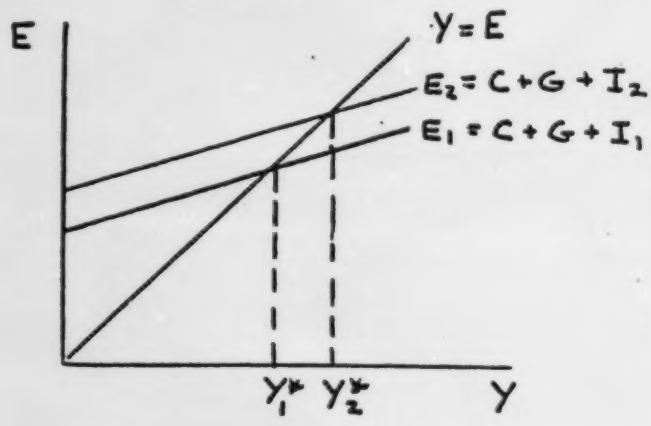


Figure 5.10 (b)



A decrease in $\bar{R}$ from $\bar{R}_1$ to $\bar{R}_2$ will result in an increase in I from I_1 to I_2 and an upward shift in the E = C + I + G line from E_1 to E_2.

The end result is an increase in Y* from Y_1^* to Y_2^*.

e. To the extent that R can be controlled by the government it is another instrument variable which can be used by the government to achieve its macroeconomic objectives, i.e., to maximize its social welfare function. As will be seen in Section 6, the government does not control R directly (as it does G), but it can influence R through what is called monetary policy. But the message remains clear, by influencing R the government can indirectly influence Y*. This means that the government has an alternative to fiscal policy in trying to achieve the combination of unemployment and inflation which is least undesirable.

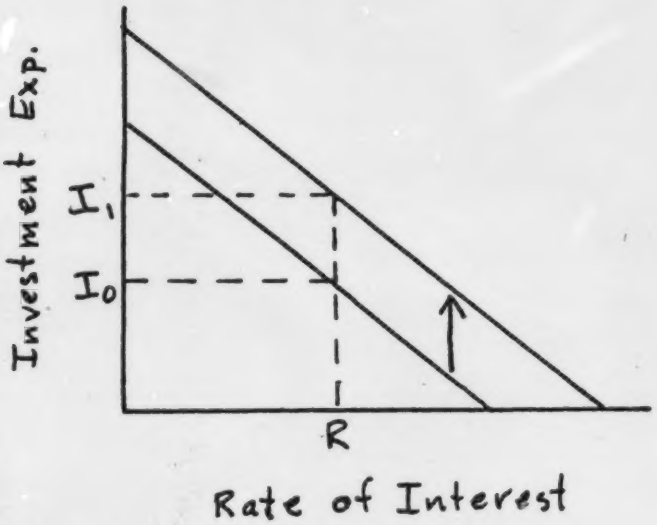
Example: Suppose that an economic research project estimated that the parameter b was equal to .6 and the parameter h was equal to -10. This means that the interest rate multiplier in the reduced form equation (5b) would be equal to $\frac{-10}{1-.6} = -25$. That is, a reduction in the rate of interest (R) of one percentage point would lead to an increase in aggregate demand (Y*) of 25. If it was determined that an increase in GNP of 50 would be necessary to bring about the target rates of inflation and unemployment, then it would be possible for the government to bring about this increase if it could reduce the rate of interest by 2 percentage points, e.g., from 8 to 6 per cent.

5.3. Other Determinants of Invesment Expenditure

5.3.1. Shifts in the rate of return schedule.

a. In Section 5.2 the relationship between investment expenditure and the rate of interest was derived from the rate of return schedule which shows the dollar amount of investment projects for which the rate of return exceeds alternative levels. Consequently, how much investment expenditure there will be for any given rate of interest will depend on the position of the rate of return schedule. The higher the rate of return schedule, the higher investment expenditure will be for any given rate of interest. In Figure 5.11 below, the shift up in the rate of return schedule results in an increase in investment expenditure from I_0 to I_1, for the given rate of interest R.

Figure 5.11



b. The effect of an increase in the rate of return schedule on Y* can be seen in the figures below. The shift in the rate of return schedule in Figure 5.12a results in an upward shift in the E curve in Figure 5.12b. This results in an increase in Y* from Y_0^* to Y_1^*. This increase in Y* is equal to the multiplier times the increase in I.

Figure 5.12a

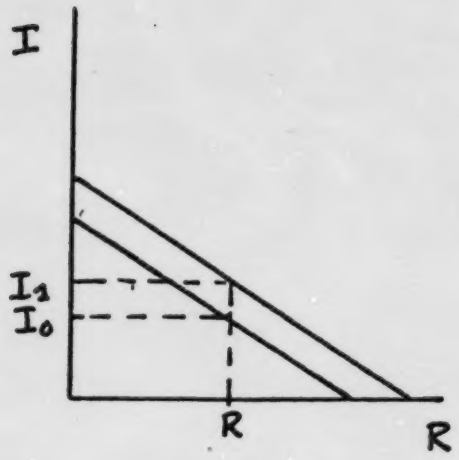
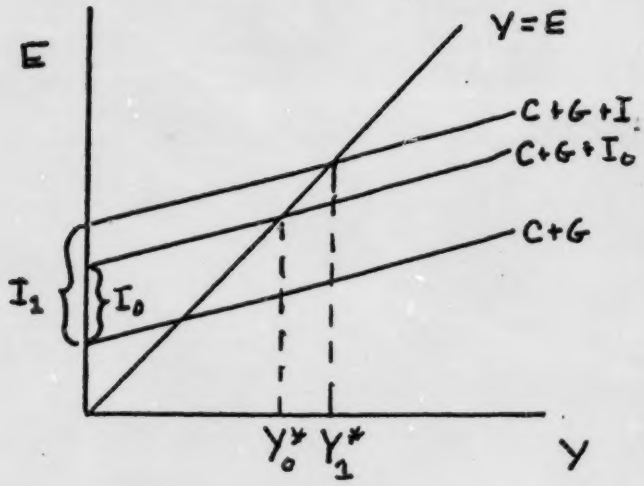


Figure 5.12b

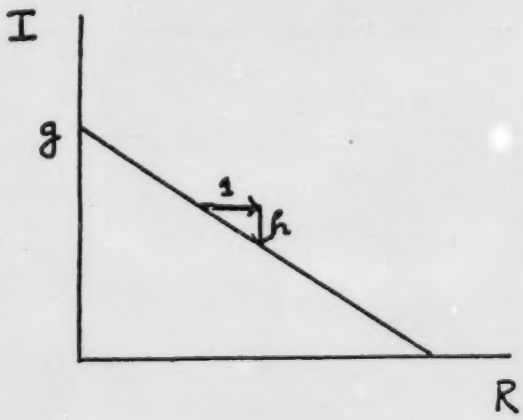


c. The consequence of a shift in the rate of return schedule on Y* can also be seen algebraically. It should be remembered that the parameter g in the investment function

$$I = g + hR$$

corresponds to the vertical intercept of the rate of return schedule in Figure 5.13 below. This means that an upward shift in the rate of return schedule implies an increase in the parameter g.

Figure 5.13



d. The exact effect of a change in g on Y* is shown by the reduced form equation for Y*:

$$(5b) \qquad Y^* = \frac{a}{1-b} + \frac{g}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{1-b}\bar{R}$$

An increase in g, ceteris paribus, will result in an increase in Y* equal to $\frac{1}{1-b}$ times the increase in g. The term $\frac{1}{1-b}$, of course, is the multiplier.

e. It can be seen by examining the reduced form equation above that the effect on Y* of a shift in the investment function is just like that of a shift in the consumption function or, for that matter, like that of any autonomous increase in expenditure. That is, it will have a multiplied effect on Y*.

f. A shift in the rate of return function will result from any change in businessmen's perception of the profitability of investment projects. If businessmen are more optimistic about the profits that can be expected from investment projects, the rate of return schedule will be higher, and for a given rate of interest, I and, therefore, Y* will be higher. Those factors which influence the profitability and, therefore, explain the volatility of investment expenditure are considered in the following sections.

5.3.2. Y as a determinant of I.

a. As developed thus far the income-expenditure model explains how a change in I will affect Y*. Whether due to a shift in the rate of return function (a change in g) or a change in the rate of interest, an increase in I will cause an increase in Y*. It is likely, however, that I will be affected by Y. That is, what the level of I is will depend on Y.

b. The reason why I may depend on Y is simply that the higher Y is the more profitable investment projects will be. At a higher level of Y, businesses will face greater demand for their output and, consequently, will find it more profitable to expand their productive capacity through investment expenditure than at a

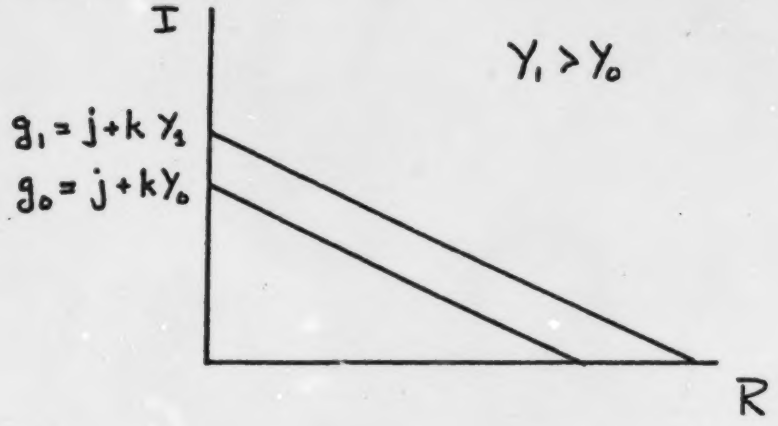
lower level of Y. That is, the height of the rate of return schedule will depend on Y, or in algebraic terms the parameter g will depend on Y.

c. In order to take into account explicitly the dependence of the rate of return schedule on the level of Y, it is necessary to re-write the investment function as follows

(7a) $$I = j + kY + hR$$

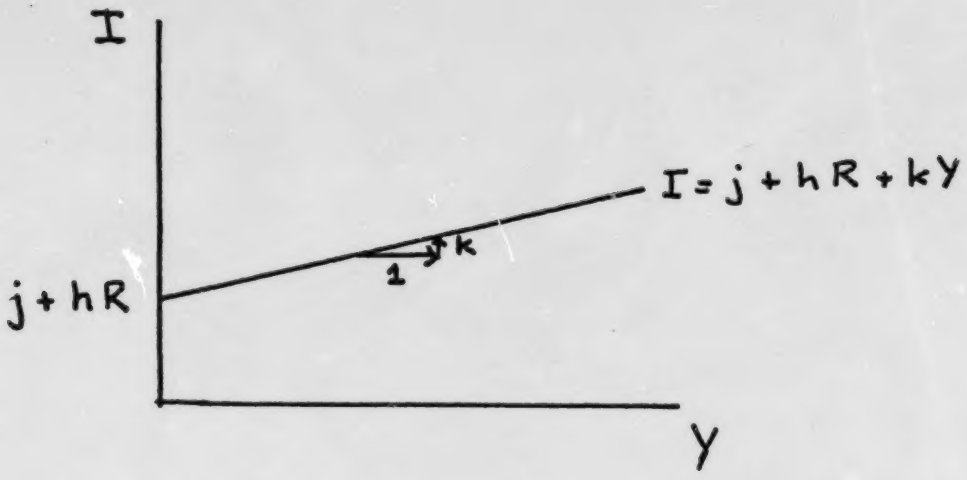
where the parameter g is replaced by the terms j + kY. Diagrammatically, this means that the intercept is no longer the sole parameter g, but is an expression which depends on the value of Y. As can be seen in Figure 5.14 below, the height of the rate of return function is greater when Y is greater.

Figure 5.14



d. The dependence of I on Y can be shown diagrammatically in another way. In Figure 5.15 below, Y is measured along the horizontal axis and I on the vertical axis. For any given R, there will be a curve which shows the level of I which will result for alternative levels of Y. The curve is upward sloping because at higher levels of Y, more investment projects will have a rate of return greater than the given R. The vertical intercept is equal to j + hR, which is the I which would result if Y were equal to zero. The slope of the curve is equal to the parameter k.

Figure 5.15



Example: The intercept j + hR could be either positive or negative depending on the values of j (which is positive), h (which is negative), and R. This intercept is the value of I when Y is 0. In the figure above the intercept was assumed to be positive. It is hard to believe that for that extremely low value of Y that any firms would want to invest. But remember that the straight line curve should be interpreted as an approximation within the observable range of Y of a more complex and probably non-linear investment function. A straight line with a positive intercept may give a good approximation for plausible values of Y even though for Y = 0 it is difficult to imagine I > 0.

e. In Figure 5.15 above, since the intercept is equal to the expression j + hR, a change in R will shift the investment function. Since h is negative, i.e., since an increase in R will reduce I, an increase in R will reduce the vertical intercept. That is, an increase in R will cause a downward shift in the curve in Figure 5.15.

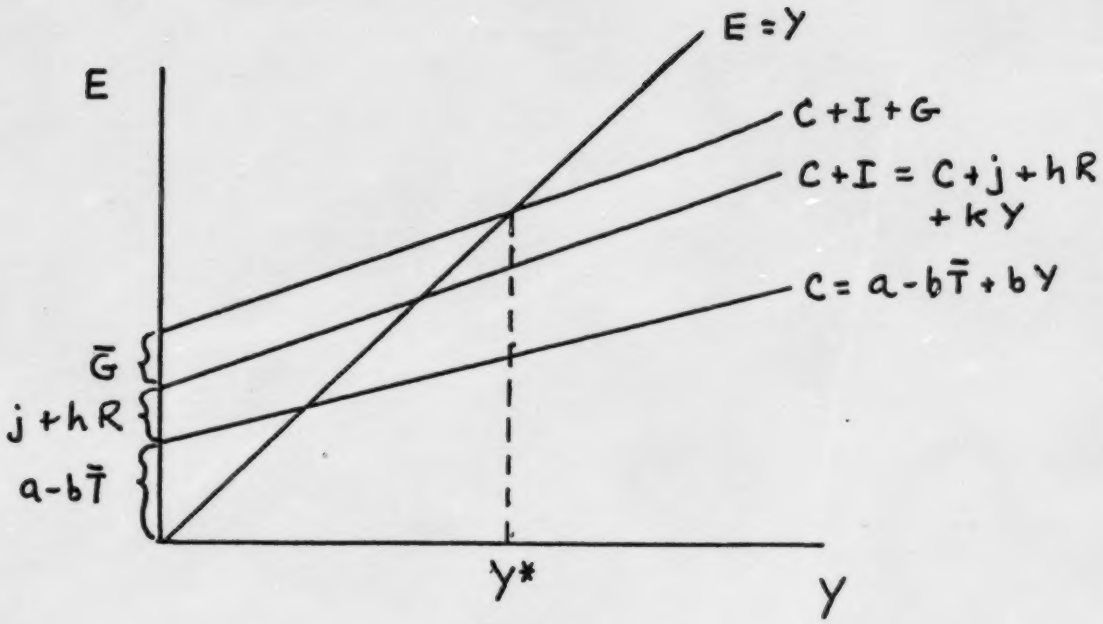
5.3.3. Solving the expanded model.

a. An income-expenditure model which incorporates the specification of the investment function developed in Section 5.3.2 is presented below:

(1)	$C = a + bY_d$	Endogenous variables:
(2)	$Y_d = Y - \bar{T}$	C, Y_d, I, Y, E
(3)	$I = j + kY + h\bar{R}$	Exogenous variables:
(4)	$E = C + I + \bar{G}$	$\bar{T}$, $\bar{G}$, $\bar{R}$
(5)	$Y = E$	Parameters: a, b, j, k, h.

b. The equilibrium value for Y can be found diagrammatically by modifying the income-expenditure diagram used previously to take into account the new specification for the investment function. This modified diagram is shown below in Figure 5.16. The $E = C + I + G$ curve is built up as before using the relationship between each of the components of E and Y. First, the relationship between C and Y is drawn in, which takes into account equations (1) and (2). Second, the relationship between I and Y is added on to the C and Y relationship, which takes into account equation (7a). Whereas previously this resulted in a C + I curve which was parallel to the C curve, now the C + I curve is steeper than the C curve since I increases as Y increases. Third, the $E = C + I + G$ curve is constructed by adding the constant amount $\bar{G}$ to the C + I curve. Finally, the $Y = E$ curve is drawn in. As before, the intersection of the $Y = E$ curve and the $Y = C + I + G$ curve determines Y^*.

Figure 5.16



c. Algebraically, the equilibrium value of Y can be found by solving for the reduced form equation for Y. This can be done, as before, by the process of substitution. First, substitute equation (2) into equation (1). Then substitute equations (1) and (7a) into equation (3). Finally, substitute equation (3) into (4). This process yields the following equation:

$$Y = a - b\bar{T} + j + h\bar{R} + \bar{G} + bY + kY$$

By subtracting bY + kY from both sides, then factoring out Y from the left hand side, and finally dividing both sides by 1 - b - k results in the reduced form equation for Y:

(5c) $$Y^* = \frac{a + j}{1-b-k} - \frac{b}{1-b-k}\bar{T} + \frac{1}{1-b-k}\bar{G} + \frac{h}{1-b-k}\bar{R}$$

d. This equation differs from equation (5b) in the following important way. The denominator in each term is now 1-b-k instead of 1-b. This means, for example, that the government expenditure multiplier is $\frac{1}{1-b-k}$ rather than $\frac{1}{1-b}$. That is, for a given value for b,

all of the multipliers are greater than before. This reflects the fact that in each round of the multiplier process the induced increase in expenditure is greater when both I and C depend on Y than when only C depends on Y. Diagrammatically, this shows up in the form of a more steeply sloped E curve. Algebraically, it takes the form of an extra term in the denominator of the multiplier.

Example: Suppose the parameter b has a value of 0.6. In the previous model for which I does not depend on Y, the value of the G multiplier is $\frac{1}{1.0-0.6} = 2.5$. In this model the value of the multiplier depends on the parameter h. If h = 0.2, then the value of the G multiplier is $\frac{1}{1.0-0.6-0.2} = 5$.

e. It should be noted that in this version of the income expenditure model the interaction between I and Y is basically the same as that between C and Y. In this and in previous models, C depends on Y and Y depends on C. The direction of causation runs both ways, which is what causes there to be a multiplier process. Similarly, in this model an increase in I causes an increase in Y and an increase in Y causes an increase in I. As a result, in each round of the multiplier process the induced increase in expenditure includes not only the induced increase in C, but also the induced increase in I. Whereas in the simpler model the multiplier was equal to one divided by one minus the marginal propensity to consume, in this model it is equal to one divided by one minus the marginal propensity to consume (b) and the marginal propensity to invest (k).

5.3.4. Other factors influencing investment expenditure.

a. In Section 5.3.2 it was recognized that the level of investment expenditure may depend on the level of national income. The reason for this was that businesses perception of the rate of return that can be earned on investment expenditure will be influenced by the

level of aggregate demand in the economy. In Section 5.3.3 the implications of this relationship for the determination of aggregate demand were derived. The main conclusion was that if I depends on Y, then the size of the multiplier will be greater. For the sake of simplicity, however, the models analyzed below will revert to the assumption that I does not depend on Y. It should be remembered, however, that this is only a simplifying assumption for pedagogical purposes. It is important to be able to derive and to remember the implications of allowing for the dependence of I on Y in the income-expenditure model.

b. It is also possible to build into the model the dependence on I on other variables which influence the rate of return. The method to be used would be the same as was employed in taking into account the dependence of I on Y. That is the investment function would be specified to include those factors which influence I and the implications for the behavior of the macroeconomy would be derived both diagrammatically and algebraically. The results would then be interpreted to facilitate an intuitive understanding of how the economy functions. In the remainder of this section several factors of importance to policy makers which are likely to influence I will be briefly discussed. There will be no formal specification of models including these variables or derivation of their implications for policy. It should be clear, however, how such a formal analysis would be carried out to verify the conclusions presented in the discussion.

c. One factor which is a likely determinant of investment expenditure is the corporate profits tax rate. In calculating the rate of return on investment expenditure, businesses are clearly interested in after-tax profits. Given the before tax rate of return on an investment project, an increase in the corporate profits tax rate will reduce the after tax rate of return. Consequently, a change in the corporate profits tax rate is likely to cause a change in investment expenditure in the opposite direction. This in turn will work through the multiplier process to bring about a change in

aggregate demand. This means that the corporate profits tax rate is another policy instrument available to the government by which it can influence aggregate demand.

Example: In 1964 Congress passed a tax law which among other changes reduced the tax rate on corporate income from 51 to 48 percent. The purpose of this change was specifically to encourage businesses to increase investment expenditure. At the time the unemployment rate was well above the government's target rate and it was hoped that the cut in the corporate profits tax rate would help to increase aggregate demand.

d. Because of the crucial role that investment expenditure has played in determining aggregate demand, the government has tried to find new ways of controlling the level of investment expenditure. One tax device which it has created for the purpose of influencing investment is the investment tax credit. Businesses are allowed to deduct from their tax liabilities a certain percent of expenditure for new capital goods. This in effect lowers the price of new capital goods by that percent which serves to increase the rate of return on investment expenditure. By raising the tax credit when aggregate demand is too low and raising it when aggregate demand is too high, the government can help keep the economy on target by influencing investment expenditure.

e. Many factors outside of the direct control of government cause the rate of return schedule to shift and therefore cause increases or decreases in I. Since these factors do not appear explicitly in any of the models presented thus far, their effects on investment must be treated as autonomous changes in I (e.g., changes in the parameters g or j). A list of these factors would include wage rates, inventions, "business confidence," expectations about the future state of the economy, and others. These many influences on investment help to explain the relative volatility of I as compared to C and G.

MACRO UNIT 6

MONEY AND INTEREST

6.1 Saving and Wealth
6.2 Money and Financial Intermediaries
6.3 The Demand for Money

6. MONEY AND INTEREST

6.1 Saving and Wealth

6.1.1. Saving

a. In studying the circular flow of income and expenditure in Section 1 it was seen that households have a potential claim on all of the income earned in the economy. That is, ultimately, households through their control of the government in a democracy and their ownership of businesses in a free enterprise system decide collectively and individually how the income earned in the economy should be used. Collectively, through the political system households decide to pay part of that income to government in the form of net taxes (taxes less transfers). Also collectively, the households which own businesses decide to keep some income in businesses in the form of retained business earnings rather than paying all of profits to households in the form of dividends. The remainder of national income, which is actually received by households, is called personal disposable income. Households decide individually how this income is to be used.

Example: In 1976 Gross National Income in current prices was $1,685 billion. Of this amount $321 billion was paid to the government in net taxes and $199 billion was retained by businesses. This was the result of collective decisions by groups of households. This left $1165 billion as disposable personal income to be used individually by households.

Example: In practice the collective decisions to pay taxes to the government or to retain profits in businesses are made on behalf of households by their representatives. In the case of taxes, these decisions are made by elected representatives (the President, Congressmen, and their appointees). With regard to retained business earnings, the decisions are made by representatives elected by stockholders (boards of directors, or their appointees, i.e., management).

b. While all of disposable personal income is available for households to make consumption expenditures, usually only part of it is spent and the remainder takes the form of saving. This raises the question of how the income that households save finds its way back into the circular flow.

Example: In 1976, disposable personal income amounted to $1165 billion in current prices. Of this $1079 billion was used for consumption expenditure and $86 billion was saved.

c. The way in which saving by households returns to the circular flow of income and expenditure can be seen by considering the form which saving takes. One major form is the purchase of corporate securities (stocks and bonds). In the case of the purchase of stocks, households essentially exchange the income saved in this form for a share of the ownership of a business and an accompanying claim on a share of the profits of that business. When a household purchases a corporate bond, it lends its saving to a business in return for the promise of repayment plus interest in the future. Through the purchase of corporate securities households enable businesses to use the income saved to make investment expenditure.

Example: As it affects the circular flow of income and expenditure, the retention of profit in a corporation as retained business earnings is equivalent to the payment of those profits to households in the form of dividends and the subsequent purchase of stock from corporations with that dividend income. The reason why the owners of businesses choose to let the business retain the income in the business is to avoid the personal income tax they would have to pay if the profits were paid out as dividends.

d. Another form of household saving is the purchase of government securities. That is, households lend part of their saved income to governments which can use this to make expenditure for goods and services. Just as businesses may want to issue new stock or borrow from households to make investment expenditure over and above business retained earnings, so may the government want to borrow from households to make expenditure in excess of net tax receipts.

e. Households, in addition to lending their saving directly to businesses and the governments by buying corporate or government bonds, may lend indirectly through financial intermediaries such as commercial banks, savings banks, and savings and loan associations. Saving in this form consists of depositing income earned into a bank or other financial institution which in turn will lend the income to businesses and the government. That is, rather than buying bonds directly from the government and businesses, households can lend (deposit) their saving to banks, etc, which use the funds to buy bonds. The bank, or other financial institution, acts as an intermediary between the lenders (households) and the borrowers (businesses and government). The role of financial intermediaries will be discussed more fully in Section 6.2..

Example: In 1976 households saved $86 billion dollars of their income. Of this total $44 billion was loaned to government and $42 billion to businesses. Of the total saving about two thirds was loaned indirectly to businesses and government through financial intermediaries.

6.1.2. Wealth

a. The part of income which is used for consumption expenditure satisfies households wants in the current period. Consequently, it is not available for use to satisfy wants in future periods. The part of income that is saved, however, can be used to satisfy wants in future periods. All expenditures for goods and services by household are treated as consumption expenditures in the national income and product accounts. In reality, however, many purchases of consumer durables -- e.g., automobiles -- are not used up (consumed) in the current period. They should

properly be treated as a form of investment expenditure by household which adds to the stock of capital goods. The purchase of an automobile provides for future production and consumption of transportation services by the household. As such it should be counted as saving and investment expenditure rather than consumption expenditure.

Example: In 1976, of the $1079 billion of consumption expenditure, $156 billion was devoted to the purchase of new consumer durable boods. This constituted gross investment by households although it is treated as consumption expenditure by the national income accounts. Depreciation on the existing stock of consumer durables amounted to about $128 billion so that net investment by households in consumer durables amounted to about $28 billion.

b. The accumulation of a household's saving in previous time periods constitute the amount of <u>wealth</u> it has at the beginning of the current period. That is, wealth is the capacity to make consumption expenditure in the future as a consequence of past saving.

Example: If a family's wealth at the beginning of 1977 was $25,000. This means that the sum total of all previous saving by that family through 1976 totalled $25,000. It also means that the family has $25,000 worth of stocks, bonds, deposits, etc. which it could sell and use the proceeds of to make consumption expenditure in 1977, 1978, or whenever it chose. If the family's income in 1977 was $15,000, then it could make as much as $40,000 in consumption expenditure during the year without borrowing any money.

c. Since wealth is the accumulation of past saving, it follows that saving during the current period equals the change in wealth from the beginning of the current period to the beginning of the next period. That is, the change in wealth during the period is equal to that period's saving.

Example: The following shows the time path of saving and wealth for a typical household:

Year	Saving (Change in Wealth)	Wealth (At beginning of Year)
1	10	0
2	15	10
3	15	25
4	- 5	40
5	.	35
.	.	.

The household begins with zero wealth. During the first year it saves 10 which leaves it with wealth of 10 at the beginning of the second year. In the second year it saves (adds to its wealth by) 15 which results in a wealth of 25 at the beginning of year 3. In year 4 it dissaves 5, which means that between the beginning of year 4 and 5 wealth decreases by 5 from 40 to 35.

d. In summary:
the wealth of any household at a point in time is equal to the accumulation of its past saving; in order to increase its wealth a household must save part of its current income; and if it consumes more than its current income it must use up some of its past savings and its wealth will decline. The same is true of the aggregate of households. Total household wealth at any point in time will have been predetermined by past household saving. Or put another way, current household saving determines the rate at which household wealth is increasing in the present.

6.1.3. Stocks and flows.

a. Thus far most of the key variables which have been introduced into the analysis have been flow variables. Gross national expenditure, gross national income, and their components are flow variables. Each is the rate (quantity per specified period of time) at which expenditure

is made or income is received. Flow variables relate to an economic phenomenon which occurs over time. Consequently, unless the length of time (e.g., month or year) in which the units are expressed (e.g., dollars of income per year) is specified, any statement about the rate of flow of the activity will be ambigous.

Definition: Flow variable -- an acitivity which occurs over time and which is measured in terms of quantity per unit of time.

Example: In the first quarter of 1976 GNP was $1,636 billion per year. This means that during the period January through March the flow of production was such that if it had continued for one year, the total amount of output that would have been produced during the year would be worth $1,636 billion. In other words, in the first quarter of 1976 output was being produced at the rate of $1,636 per year. If the units of GNP were not explicitly stated, or implicitly understood, to be "dollars worth of output per year", then it would be unclear whether it was dollars per month, per quarter, per year, or per decade.

Example: Many variables outside of economics are flow variables. One example is miles per hour, which measures the rate at which an object covers distance per time period. When it is said that a car is travelling at a speed of 60 m.p.h., it does not mean that the car has travelled 60 miles or that it has been travelling for an hour. It means that if the car travelled at that rate for one hour, it would cover the distance of 60 miles. If someone said "I was travelling at a speed of 60 miles", unless it was understood what unit of time was involved, the statement would not give any indication as to how fast the person was travelling.

b. Two important macroeconomic variables have been discussed in Sections 5 and 6 which are not flow variables, but rather are stock variables.

These are the stocks of capital goods and wealth. They indicate the value of capital goods and the accumulation of past saving which are in existence at a point in time. Unlike flow variables, stock variables do not involve an activity over time.

Definition: Stock variable -- a variable which takes on a quantity at every point of time, but which is expressed in units without any time dimension.

Example: The difference between the stock and flow variables can be illustrated by the relationship between a river and a lake. A river is a flow of water and a lake is a stock of water. The size of a river is measured by the quantity of water passing a point per period of time, e.g., gallons per minute. (One might say, "the river is currently flowing at a rate of 2000 gallons per minute".) The size of a lake is measured by the quantity of water at a point in time, e.g., gallons. ("This morning, the lake contained 20,000,000 gallons of water".)

c. As was seen in the discussion of the stocks of capital goods and wealth, there is a relationship between stock and flow variables which determines the amount of the stock variable at any point in time. The change in the stock of capital goods from the beginning to the end of a period is determined by the flow of net investment expenditure during the period. Similarly, the change in the stock of wealth from the beginning to the end of a period is determined by the flow of saving during the period.

Example: This relationship between stock and flow variables can be seen by considering the size of a lake and the size of the river which feeds it. Just as the stock of capital goods at a point of time is equal to the sum of all past net investment (gross investment less depreciation), so too the size of the lake at a point of time is equal to the sum of all the past net inflow of water from the

river (gross inflow from the river less evaporation from the lake). Just as the stock of wealth at a point in time will have been predetermined by past flows of saving, so too the stock of water in the lake at any point in time will have been predetermined by past values of the river flow.

d. Another stock variable which has been discussed is the stock of government debt. This is the amount at any point in time which the government owes to the holders of government securities. The stock of government debt is equal to the accumulation of all past deficits. Consequently, the government deficit in any period equals the increase in the stock of debt from the beginning to the end of that period.

6.1.3. The composition of wealth

a. Previously, it was explained that for a "closed" economy the saving of households (S) is equal to the deficit of the government plus the deficit of business. That is, housedholds make their saving available, either directly by purchasing securities or indirectly through financial intermediaries, to businesses and government. This can be seen by remembering that total expenditure and total income are equal, i.e.,

$$Y = E.$$

This means that the sum of the components of income equals the sum of the components of expenditure, i.e., household disposable income plus government net taxes plus business retained earnings equals consumption plus investment plus government expenditure. In symbolic form this identity can be written as

$$Y_d + T + BRE = C + I + G$$

By rearranging terms, this equation can be rewritten as

$$(Y_d - C) = (I - BRE) + (G - T).$$

This, in words, means that household saving $(Y_d - C)$ equals the sum of the business deficit (I-BRE) and the government deficit (G-T).

Definition: Security -- a claim on the future income of the issuer which may be in the form of a claim on a specific amount in interest plus principal (bonds), or a claim on the residual income after all other obligations have been met (common stocks). In return for such a claim on future income the buyer of the security pays the issuer income in the present out of the buyer's current saving.

Example: When General Motors issues securities (say in the form of common stocks), the buyers acquire a claim on the future profits of the company. The proceeds that General Motors receives from the sale of the securities enables the company to acquire new capital goods and thereby enhance its prospects for future profits on which the buyers of the new securities now have a claim.

d. Since (i) household saving is equal to the increases in business and government securities, and (ii) household wealth is equal to cumulated past household saving, it follows that household wealth (W_h) is equal to outstanding stocks (the accumulation of past issues) of business securities (B_b) and government securities (B_g). In symbols:

$$W_h = B_b + B_g.$$

6.1.4. Balance sheet accounting

a. The equality between aggregate household wealth and business and government securities can be seen in terms of a balance sheet accounting of the household, business and government sectors. A balance sheet is an account which shows all of the assets (claims on others), liabilities (obligations to others), and net worth (wealth) for an individual group. By definition, net worth equals total assets minus total liabilities.

Example: The following are individual balance sheets for Paul and Peter:

Paul's Balance Sheet

Assets:		Liabilities:	0
B_g	100		
B_b	500		
Peter's IOU to Paul	75	Net worth:	675
Total	675	Total	675

Peter's Balance Sheet

Assets:		Liabilities:	
B_g	400	Peter's IOU to Paul	75
		Net worth:	325
	400		400

Paul's balance sheet shows that he has assets consisting of 100 worth of government securities (B_g) 500 of business securities (B_b) and an IOU issued by Peter in the amount of 75. Paul has no liabilities, so his wealth (net worth) is 675 which is the value of his total assets. Peter's assets consist of 400 worth of government securities. He has liabilities in the amount of his IOU to Paul. Consequently, Peter's wealth is equal to the value of his assets (400) minus the value of his liabilities (75) which is 325.

b. When analyzing the behavior of the aggregate of households with respect to their holdings of wealth, it is appropriate to consider a <u>consolidated</u> balance sheet for the household sector. A consolidated balance

sheet shows the assets held by households which are not the liabilities of other households. That is, the IOU's issued by one household and held by another are cancelled out in constructing a consolidated balance sheet.

Example: If a consolidated balance sheet were constructed for Peter and Paul, whose individual balance sheets appear in the previous example, the IOU which is Peter's liability and Paul's asset would not appear. This is because Paul's asset cancels out Peter's liability when their joint position is considered as in the balance sheet below:

Paul's and Peter's Consolidated Balance Sheet

Assets:		Liabilities:	0
B_g	500		
B_b	500	Net Worth	1000
Total assets:	1000	Total Liabilities plus Net Worth:	1000

c. If (i) there were no financial institutions such as banks, and (ii) expenditure by households is counted as consumption expenditure, the only possible use of saving by households would be the acquisition of business and government securities. In such a world the balance sheet of the household sector would appear as below:

Household Sector Consolidated Balance Sheet

Assets		Liabilities	
B_g		None	
B_b		Net Worth	
		W_h	
Total Assets:	$B_g + B_b$	Total Liabilities Plus Net Worth:	W_h

The assets of households consist of B_g and B_b which have been accumulated with past saving. The liabilities of the household sector are zero because loans made by one individual household to another are consolidated, since such a liability for one household is simply the asset of another. The wealth of the household sector is simply the sum of government and business securities held by households. There are no capital goods owned directly by households because it is assumed that expenditure for consumer's durable goods is consumption, not investment, expenditure. In section 6.2. the way in which the existence of financial institutions, such as banks, affects the analysis will be considered. At this point, however, the assumption will be made that there are no banks, etc., into which households may deposit saving.

d. If household expenditure is treated as saving and investment expenditure, then household saving would include the amount of net investment in consumer durables and the household balance sheet would include the stock of consumer durables (K_h) as an asset. That is, the household balance sheet would appear as:

Household Sector Consolidated Balance Sheet

Assets	Liabilities
B_g	None
B_b	Net Worth
K_h	W_h
Total Assets: $B_g + B_b + K_h$	Liabilities + Net Worth: W_h

Example: For many households the most important asset is their home. The official national income accounts treat the purchase and ownership of a house as a business activity. That is, when a household purhcases a house, the household (in this context only) is regarded as an unincorporated business and the purchase as investment expenditure. Consequently, the existing stock of houses is treated as

capital goods owned by businesses. For this reason houses do not appear as assets in the balance sheet for the household sector.

d. The balance sheet for the aggregate of all businesses (the business sector) is the consequence of past investment decisions of businesses. Each period a business decides how much investment expenditure to make and must issue enough new securities to finance the purchase. Consequently, the assets of the business sector will consist of the stock of capital goods accumulated by business (K_b) and the liabilities will consist of the securities issued in the process of accumulating that stock of capital goods (B_b). The balance sheet of the business sector will appear as follows.

Business Sector Consolidated Balance Sheet

Assets	Liabilities
K_b	B_b
	Net Worth
	None
Total Assets: K_b	Liabilities + Net Worth: B_b

It follows from this that the value of a businesses outstanding stocks and bonds equals the value of the capital goods it holds.

Because a business issues securities whenever it accumulates capital goods it does not accumulate any wealth itself. Essentially a business is an institution which acquires, holds, and manages capital goods on behalf of its owners. The wealth constituted in those capital goods appears in the accounting framework constructed here as wealth of the households owning the stocks and bonds issued by businesses.

e. The government sector of the economy also has a consolidated balance sheet. The government's assets consist of the stock of capital goods (such as highways, buildings, airports, etc.) accumulated through past government investment expenditure. Its liabilities are composed of government securities issued in previous periods to finance excess of government expenditure over net tax receipts (deficits). The net worth of the government sector equals the difference between its stock of capital goods (K_g) and the stock of outstanding government debt (B_g) as shown in the balance sheet below.

Government Sector Consolidated Balance Sheet

Assets	Liabilities
K_g	B_g
	Net Worth
	$K_g - B_g$
Total Assets: K_g	Liabilities & Net Worth: K_g

f. It is possible to consolidate the household, business, and government balance sheets to construct a consolidated national balance sheet. In doing so, the IOU's which are assets for one sector and liabilities for another would cancel out each other. Government securities, for example, which are assets of households and liabilities of government would not appear in a national balance sheet. Similarly, business securities are liabilities of businesses and assets of households and would not appear in a consolidated balance sheet for the economy as a whole. As a consequence, the balance sheet for the national economy would not include any financial assets and liabilities since these are

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simply claims of one sector on another which cancel out when the sectors are consolidated. The national balance sheet would appear as follows:

Consolidated National Balance Sheet

Assets	Liabilities
K_h	None
K_g	Net Worth
K_b	$K_g + K_b + K_h$
Total Assets: $K_g + K_b$	Total Liabilities & Net Worth: $K_g + K_b$

Notice that when the economy as a whole is considered, its wealth consists only of real assets (K_h,K_g,K_b). This makes common sense, since what determines the economic well being of a nation is its productive resources.

Example: The consolidated balance sheets for the U.S. economy at the beginning of 1976 are given below. (Values are in billions of dollars in current prices. Consistent with the assumption that the U.S. is a closed economy, IOU's between the U.S. and foreigners have been ignored.

Household Sector

Assets		Liabilities	
Government Securities	741	None	
Business Securities	3,887	Net Worth	
Consumer durables	497	Assets - Liabilities	4,384
Total Assets:	4,384	Liabilities & Net Worth:	4,384

Business Sector

Assets		Liabilities	
Residential Structures	1,304	Corporate Securities	1,575
Non-residential Structures	508	Non-corporate securities	2,312
Equipment	435	Net Worth	
Inventories	599		
Land	1,041	None	
Total Assets	3,887	Liabilities & Net Worth	3,887

Government Sector

Assets		Liabilities	
Residential structures	33	Federal Securities	525
Non-residential Structures	745	State & Local Securities	216
Equipment	109	Net Worth	
Inventories	108		
Land	243	Assets-Liabilities	497
Total Assets	1,238	Liabilities & Net Worth	1,238

Consolidated National Balance Sheet

Assets		Liabilities	
Government capital & land	1,238	None	
Business capital & land	3,887	Net Worth	
Consumer durables	497	Assets-Liabilities	5,622
Total Assets:	5,622	Liabilities + Net Worth:	5,622

6.2. Money and Financial Intermediaries

6.2.1. Financial Intermediaries

a. In the preceding section a description was made of the financial structure of the economy without financial institutions such as banks. Households saving other than investment in consumer durables was described as taking the form of acquisitions of securities issued by businesses and government. As a consequence, the wealth of households envisioned as being composed of real assets in the form of consumer durables and financial assets in the form of business and government securities.

b. In reality, a substantial part of household saving consists of deposits in banks or other financial intermediaries. The financial intermediary uses the funds it obtains to acquire the securities issued by businesses and government. In effect, then, the saving deposited in financial intermediaries are made available indirectly by households to businesses through intermediaries such as banks.

Definition: Financial intermediary -- a public or private institution which buys one type, and sells another type, of financial instrument. That is, it lends to some economic agents and obtains the funds to do so by borrowing from others.

c. In the following discussion, attention will be focussed on a particular type of financial intermediary called commercial banks. Like all financial intermediaries, a bank both buys and sells financial instruments. The type that it buys are the securities of the government and businesses. The type that it sells are deposit accounts. Consequently, banks have assets made up of business and government securities, and liabilities made up of deposit accounts.

Definition: Deposit account -- an obligation to pay a creditor of the bank the amount which has been deposited in the accounts.

Example: When someone makes a deposit in a bank, he or she acquires a deposit account which is an asset of the individual and a liability of the bank. A checking account is

a promise to pay on demand the amount that has been deposited. These are, therefore, called demand deposits. A savings account is a promise to pay within a stipulated period of time. These are, therefore, called time deposits.

d. The consolidated balance sheet of all banks might appear as follows:

Assets	Liabilities
B_g	Deposit accounts
B_b	Net worth
	None

Over time the banks will have accumulated the saving deposited by households in return for which it will have issued deposit accounts. It will have used the funds to accumulate the securities of businesses and the government. (In the real world, like other businesses, banks acquire capital goods in the form of buildings, etc., and issue securities in the form of common stocks and bonds. These have been suppressed in the analysis to make clear banks' function as financial intermediaries.)

e. The consolidated balance sheet of households now needs to be revised to take into account the existence of deposit accounts (D) as an asset which households can accumulate with their saving:

Household Sector Consolidated Balance Sheet

Assets	Liabilities
Consumer durables	None
B_b	Net Worth
B_g	W_h
Deposits	

Now in the household sector's balance sheet financial assets include deposits in banks as well as direct holdings of business and government securities.

6.2.2. The Federal Reserve.

a. An especially important financial intermediary is the Federal Reserve Bank which is an agency of the federal government. It is the United States' "central bank" which means it has responsibility for carrying out the policies of government in most financial or monetary matters. For example, the Federal Reserve regulates the banking practices of private commercial banks. The Federal Reserve's most important function is as a special financial intermediary between the government on one hand, and commercial banks and households on the other.

b. The Federal Reserve's assets consist entirely of government securities. It obtains the funds to buy these assets primarily by issuing deposit accounts to commercial banks. That is, commercial banks take some of the funds they obtain from households' deposits and instead of buying securities they deposit those funds in the Federal Reserve which the Federal Reserve in turn uses to buy government securities. In effect, part of households' saving is loaned to the government indirectly through two financial intermediaries: commercial banks and the Federal Reserve.

c. The Federal Reserve also obtains funds to acquire government securities by issuing Federal Reserve Notes to households and others. These are a special IOU of the Federal Reserve and make up the US currency. At the top of a dollar bill, it will say that it is a Federal Reserve Note. The holders of currency, or Federal Reserve Notes, have loaned part of their saving to the Federal Reserve which has in turn loaned it to the federal government. These notes are "legal tender" which means that by law they must be accepted as means of payment of any debt or other obligation. That is, if you buy goods and services or repay a debt with Federal Reserve Notes they must be accepted by the seller or creditor.

d. The balance sheet of the Federal Reserve has assets consisting almost entirely of government securities. The liabilities of the Federal Reserve are composed of deposit accounts of commercial banks with the Federal Reserve and Federal Reserve Notes held by banks and the non-bank public. As with private financial intermediaries, the Federal Reserve has zero net worth. That is, as a financial intermediary, every dollar of assets it acquires is matched by a dollar of liabilities it issues. When the Federal Reserve buys a government security it can pay for it by a check drawn against itself. The seller of the government security can either cash the check for Federal Reserve Notes or deposit the check in his bank which in turnwill deposit it in its account with the Federal Reserve. Either way, the purchase of the government security by the Federal Reserve results in an equal increase in Federal Reserve liabilities in the form of Federal Reserve Notes or commercial bank deposits in the Federal Reserve. Consequently, the Federal Reserve's balance sheet will appear as follows.

Federal Reserve Balance Sheet

Assets	Liabilities
B_g	Deposits of commercial banks
	Federal Reserve Notes
	Net Worth
	None

e. The balance sheet of the household sector must be revised once again, this time to account for the possibility that households can hold part of their wealth in the form of Federal Reserve Notes.

Household Sector Consolidated Balance Sheet

Assets	Liabilities
Consumer durables	None
$B_b + B_g$ Deposits in banks	Net Worth
Federal Reserve Notes	W_h

The balance sheet above indicates that part of the past saving of households has been made directly available to businesses and government with the acquisition of securities and part has been made available indirectly through commercial banks with the acquisition of deposit accounts and through the Federal Reserve with the acquisition of Federal Reserve Notes.

The balance sheet of the banking sector must also be revised to take into account the fact that it holds part of its assets in the form of both deposit accounts in the Federal Reserve and Federal Reserve Notes. This part of their assets is called bank serves, because they are funds which are not used to purchase securities but are held on reserve to meet any demand for withdrawal of funds by depositors.

Banking Sector Consolidated Balance Sheet

Assets	Liabilities
B_g	Deposit accounts
B_b	Net Worth
FR Deposits, FR Notes } Reserves	None

Banks use most of the funds made available to them by depositors to lend to businesses and government. Some funds, however, are used to acquire reserves (in the form of Federal Reserve Deposit Accounts and Federal Reserve Notes) which represents indirect loans through the Federal Reserve to the government.

6.2.3. Money

a. In the preceding sections, the balance sheet for the household sector was developed to take into account the possibility of households hold-

ing as their assets the liabilities issued by financial intermediaries. The four types of assets that appeared in the household sector's balance sheet were government securities, business securities, deposit accounts in commercial banks, and Federal Reserve Notes. The latter two components are what economists define to be money.

Definition: Money -- something generally accepted as a means of payment.

b. As was mentioned earlier, Federal Reserve Notes by law must be accepted as means of payment and, therefore, are a form of money. That Federal Reserve Notes (i.e., currency or dollars) are money is generally understood even by people who do not know what the definition of money is. But what is not generally understood is that bank deposits are also a form of money. Deposit accounts are a form of money because they can be used as a means of payment. When someone uses a check drawn against their bank account to purchase a commodity they are using their deposit account as a means of payment.

c. In the real world, businesses as well as households hold part of their assets in the form of money. To keep the balance sheet accounting as simplified as possible, it has been assumed that businesses hold only capital goods as assets. This assumption will be maintained throughout the analysis. It should be understood, however, that in reality the money supply consists of currency and deposit accounts held by both households and businesses.

Definition: Money supply -- the stock of money in existence at any point in time, i.e., the stock of currency plus the stock of deposit accounts held by the non-bank public (households plus businesses).

Example: Economists have three alternative definitions of the money supply (M) that are used in statistical analyses of the economy: M_1, M_2, and M_3. M_1 is the stock of currency plus demand deposits in commercial banks. M_2 is M_1 plus time deposits in commercial banks. M_3 is M_2 plus deposit accounts in savings banks, savings and loan associations, and other thrift institutions.

d. It has not always been true that the liabilities of financial intermediaries are the predominant form of money. Anything which the members of a community are willing to accept in payment for goods or debts is money. For many centuries coins were the primary form of money in the western world. In other societies shells, cloth, beads, livestock, and stones have served as money. In prisoner of war camps, cigarettes were used as money. In all of these cases the commodity used as money was something that was widely accepted in payment for goods and services or for repayment of an IOU.

e. The reason why the liabilities of banks are generally accepted as means of payment is that they are virtually free of any risk of default, which means that they can readily be converted into currency which is legal tender. In addition, bank accounts eliminate the risk of theft and are in many ways more convenient than currency as a form of money. Consequently, deposit accounts make up the bulk of the money supply.

Example: At the end of 1976 the money supply was as follows:

		billions of dollars
M_1	Currency	80
M_1	Demand deposits	232
M_2	Time deposits in commercial banks	428
M_3	Time deposits in thrift institutions	497

f. Because money is an asset (i.e., a store of value) which is generally accepted as a means of payment (i.e., a medium of exchange), it also serves as a measure of value (i.e., a unit of account). That is, because people use money to pay for goods and services, it is convenient to measure the value of goods in terms of money units (i.e., dollars).

Example: It would be possible to quote the prices of goods in terms of commodities other than money. It would be much more difficult to compare the costs of different goods, however, if each seller quoted prices in terms of a different commodity. If, for example, the Ford dealer

stated the price of his car in terms of bushels of wheat and the Chevrolet dealer quoted a price in terms of gallons of gasoline, the potential buyer would have more difficulty making comparisons than if both dealers announced prices in terms of dollars.

g. It is difficult to imagine how the U.S. economy would function without money to serve as a medium of exchange and unit of account. It would be necessary for consumers and producers to exchange goods and services for other goods and services rather than to make exchanges of goods and services for money which can then be used to make exchanges for other goods and services. In such a barter economy the problems involved in matching traders with compatible demands and supplies would be enormous.

Example: Imagine the problem of a lumberman who has wood to sell but wants to buy clothing, food, entertainment, transportation. In order to buy a shirt, he must find someone who is offering a shirt who wants lumber. If there is no one, he might find someone with whom he can exchange lumber for extra food and then exchange that food for a shirt. Unfortunately, it quickly becomes very complex and almost impossible to manage, especially when many products are expensive and indivisible (e.g., washing machines, autos). With money as a medium of exchange and as a unit of account, the trading process becomes so much simpler.

6.3. The demand for money

6.3.1. Alternative forms of holding wealth

a. As was discussed in section 6.1, at any point in time households hold a certain amount of wealth which is the result of past saving. This wealth can be held in three forms: stocks of consumer durables, securities (i.e., claims on businesses and the government), and money (i.e., claims on financial intermediaries which in turn hold claims on businesses and the government). Thus, individual households must decide how much of their wealth they should hold in the form of consumer

durables, how much in securities, and how much in the form of money.

Example: A household may, through its past saving, have accumulated wealth totalling $100,000. As a result of its past decision this total might be divided as follows:

Consumer durables	$40,000
Securities	55,000
Money	5,000
Total	100,000

It is possible for the household to change the form in which it holds wealth immediately. It could, for example, increase its money holdings and decrease its security holdings by selling a bond. Or, it could sell a bond and use the proceeds to buy a car. The household is not locked in, by the way in which it used its past saving, to holding its wealth in any particular form.

b. For the sake of simplicity, it will be assumed that the household has decided how much of its wealth to hold in the form of consumer durables. This leaves it with the decision of how to divide its total holdings of financial assets between money and securities. In some ways this decision is very much like the decision that households make as to how to divide their income between consumption expenditure and saving. Just as a decision to consume a certain fraction of income is at the same time a decision to save the remainder, so a decision to hold part of financial assets in the form of securities is at the same time a decision to hold the remainder in money. In both cases there is one decision to make, but that decision can be viewed in two ways. The decision about how to use income can be viewed as either a consumption decision or a saving decision. Similarly, the decision about the form in which to hold financial assets can be viewed as a decision about either how much securities or how much money to hold. Traditionally, economists have treated this as a decision about how much money to hold and that approach will be adopted here.

c. While there is a great deal of similarity between the consumption-saving decision and the money-securities decision, it is important to be aware of the difference between them. The first of these is a decision about how to divide the flow of income between the flow of consumption and the flow of saving. The second is a decision about how to divide the stock of financial assets between the stock of money and the stock of securities. The terms "income", "money", and "wealth" are frequently confused because in everyday language they are often used interchangeably. In economics, however, they have very precise meanings. While they are interrelated, they each have a separate definition and they should not be regarded as synonyms.

Example: In everyday language, if you wanted to inquire about how well-off a person was, you might ask any of the following questions:

(i) How much money do you have?

(ii) How high is your income?

(iii) How wealthy are you?

In the economist's language, each of these is a different question. The first asks how much of a particular type of asset the person has. It is possible for the person to have a high income and great wealth but very little money, if he held most of his wealth in the form of securities. The second asks how much the person earns per year in wages, interest, rent, and profit. It is possible for a person to have a very high income and very little wealth if he had saved only a little out of past income. The third asks how great is the accumulation of past saving. This would be large if past saving was large, whether current income is large or small.

d. The problem to be considered here, then, is the following: Given their wealth (which is predetermined in the short-run by past saving), and their holding of consumer durables, what determines how households would like to divide their remaining wealth (financial assets) between money and securities?

In terms of the traditional point of view, the question is: what determines the demand for money in the short-run, i.e., the stock of money that households would like to hold, given their total financial assets? It will be seen later (i) that equilibrium requires the demand for money to be equal to the supply of money, (ii) that equilibrium is brought about by adjustment of endogenous variables in the modified income-expenditure model, and (iii) that government monetary policy can influence the supply of money and, thereby, the equilibrium values of the endogenous variables in the model. But before these matters can be understood, it is necessary to consider the problem of what determines the demand for money.

6.3.2. Determinants of the demand for money

a. It will be recalled that a distinguishing characteristic of money is that it is generally accepted as a means of payment. In a market economy it is difficult to make payment for a good or service without the use of money in some form, whether it be currency (Federal Reserve Notes) or a check drawn against a deposit account in a commercial bank. Since most households make consumption expenditure on a regular basis, they will want to have some money available for making transactions in the markets for goods and services. The higher the level of national income, the higher will be the level of expenditure that households would like to make, and, consequently, the higher will be the amount of money that they would like to hold for the purposes of making transactions. That is, the flow of national income (Y) is a determinant of the stock of money (M) that households would like to hold. The need to have money available to make expenditure for goods and services is called the <u>transactions motive</u> for holding money.

b. If a household did not hold any of its financial assets in the form of money, then whenever the household wanted to purchase a good or service, it would be necessary to sell some of its securities to obtain the the money (i.e., the generally accepted means of payment) required to make the purchase. Since purchases of goods and services are made frequently by households, it would be expensive in terms of time,

annoyance, and brokerage fees to hold all wealth in the form of securities and none in the form of money. For the aggregate of households, then, it can be expected that the higher the level of national income (i.e., total purchases of goods and services), the higher will be the demand for money.

c. In deciding how much money to hold, households will also want to consider the benefits to be obtained from holding securities. The principal benefit that accrues from holding a security is the income in the form of interest (or dividends if it is a common stock) that the household would receive. The higher the interest that the household owning a security would receive, the more desirable would be securities relative to money as a form of holding wealth. Consequently, the higher the rate of interest, given total financial assets and national income, the greater will be households' demand for securities and the lower will be their demand for money.

d. Two factors have been identified as having an influence on the demand for money: national income (Y) and the rate of interest (R). The higher Y and the lower R, the greater will be the demand for money. The decision by households as to how much money to hold is the outcome of trying to balance two opposing motives: (i) the desire to hold money to accommodate purchases of goods and services without incurring the costs of converting securities into money, and (ii) the desire to hold securities in order to earn income from wealth in the form of interest. An increase in Y, given R, will strengthen households' transactions motive for holding money. An increase in R will increase households' income earning motive for holding securities.

6.2.4. Algebraic and diagramatic representation of the demand for money

a. Because there are two variables which influence the demand for money, it is simpler to represent this structural relationship algebraically than diagrammatically. By assuming that the relationship between the quantity of money demanded (M), the level of national income (Y), the rate of interest is linear, it is possible to write the demand-for-money-function as:

(8) $M = k + mY + nR.$

In line with the reasoning set out in the preceding section, the parameter m will be positive and n will be negative. The parameter m indicates the amount by which the quantity of money demanded will increase for each unit increase in Y. The parameter n indicates the amount by which M will decrease for each unit increase in R.

b. In order to represent the demand-for-money-function in a two dimensional diagram, it is necessary to draw a relationship between M and one of the right-hand-side variables for a given value of the other right-hand-side variable. Usually Y is held constant and the relationship between R and M is drawn, as in the figure below:

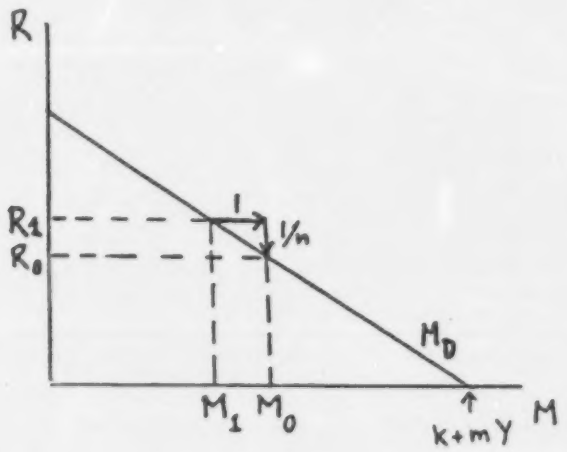


Figure 6.1

R is measured on the vertical axis and M on the horizontal axis. The horizontal intercept is determined by the parameters k and m and the variable Y. The slope is equal to 1/n.

c. In Figure 6.1 above, a change in R, with Y constant would be reflected in a movement along the curve. An increase in R from R_0 to R_1 would result in movement up the curve which would indicate a reduction in the quantity of money demanded from M_0 to M_1. A change in Y, however, would be reflected in a shift in the curve as in figure 6.2 below:

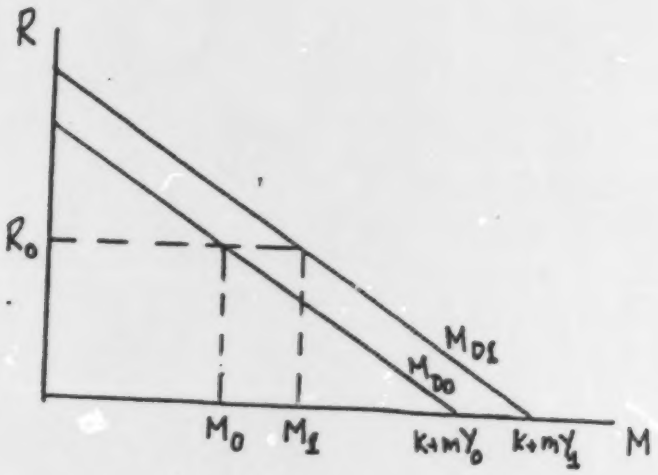


Figure 6.2

An increase in Y from Y_0 to Y_1 would result in an upward shift of the curve from M_D to M_D . For a given level of R, say R_0, this would indicate an increase in the quantity of money demanded from M_0 to M_1.

6.3.5. Equilibrium in the money market

a. In section 6.2 the supply of money was defined to be the stock of liabilities of financial intermediaries (including the Federal Reserve) held as assets by the non-bank public. Under the simplifying assumptions used here, this includes the deposits in banks and currency held by households. Since, as will be seen later, the Federal Reserve can adjust its holdings of government securities and, therefore, the amount of its liabilities, to whatever level it wishes, it is assumed that the supply of money is an exogenous variable. That is, the money supply (M) is independent of the rate of interest (R), national income (Y), and other endogenous variables in the income-expenditure model. For this reason, if the supply of money is represented in the same diagram as the demand for money, it would appear as the vertical line (M_s) in figure 6.3. below:

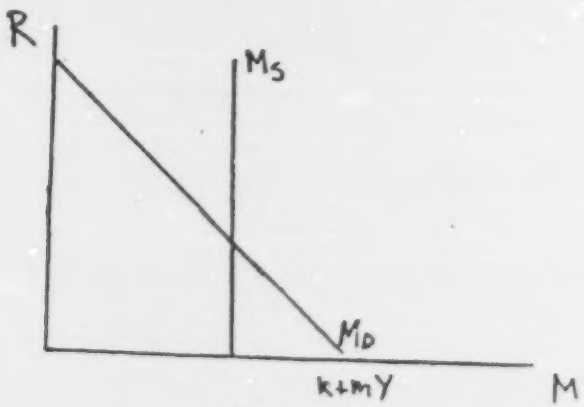


Figure 6.3

M_s is vertical because the supply of money does not depend on the rate of interest. That is, for every rate of interest, the quantity available is the same, namely $\bar{M}$.

b. As in any market, equilibrium requires that the quantities supplied and demanded be equal. If they are not, then there will be a tendency for some variable to change. If the equilibrium is stable, then the induced change in response to the disequilibrium will move the market toward equilibrium. In the market for money, when demand and supply are not equal there is a tendency for the rate of interest to change. Why this is true and whether it will move the money market toward equilibrium is the subject of this section.

Example: In markets for goods and services it is the price of the product which adjusts when there is excess demand or supply. Given the ordinary shapes of the demand and supply curves, the change in price in a disequilibrium moves the market back toward equilibrium.

c. To understand how the money market adjusts in a disequilibrium situation, it is helpful to remember that households' financial assets can be held in two forms: money and securities. When they are holding less money than they want, given their total financial assets, this means that they are holding more securities than they want. That is, given the amount of consumer durables, an excess demand for money is necessarily at the same time an excess supply of securities. Similarly, if there is an excess supply of money, i.e., the supply of money exceeds the demand, it means that there is an excess demand for securities, i.e., the amount of securities in existence is less than the amount households want to hold.

d. Given the amount of their wealth that they want to hold in the form of consumer durables, the only way in which households can respond to an excess demand for money is to try to increase their money holdings by decreasing their security holdings. That is, they will try to sell some of their securities and, thereby, both reduce their holdings of securities and increase their holdings of money. The effect of this,

as in other markets, is to drive down the price of the commodity in excess supply. The competition of sellers and the willingness of buyers to pay a lower price will result in a decline in the price of securities. If there were an excess supply of money, households would adjust by using their excess holdings of money to try to buy securities, thereby driving up the price of securities.

e. Any change in the price of securities will have an effect on the rate of interest in the opposite direction. To see why this is so, consider the relationship between the rate of interest and the price of a one-year bond. A one-year bond is simply a promise to pay a certain amount in one year's time. The borrower issuing the bond simply sells such a promise to pay for as much as he can at the time he needs to borrow money. If the amount that is promised to be paid in one year is X, then the price at which the bond can be sold will depend on the rate of interest prevailing in the securities market. The purchaser will be prepared to pay a price (P) for the bond which will yield him a rate of return equal to the rate of interest (R) prevailing in the market. That is, the buyer will pay a price for the bond such that

$$X = P + RP$$

$$P = \frac{X}{I+R}$$

Example: Suppose the issuer of a one-year bond promised to pay $110 one year from now. If the rate of interest in the market were ten percent, a buyer would be willing to pay $100 for the bond, but no more. At a price of $101, he would earn less than ten percent interest and, therefore, would be better off lending to someone else.

f. The higher the rate of interest in the market, the <u>lower</u> will be the price which a buyer would be willing to pay for a given amount promised in one year's time. Conversely, the lower the price of a bond, the higher will be the rate of interest on that bond. It follows, then, that if the price of bonds in the securities market falls, then the rate of interest will rise. If the buyer of a bond is going to receive amount X in one year, then the lower the price paid for that promise

to pay, the greater will be the rate of interest earned.

Example: If the amount promised to be paid in one year is $110, then the interest rate earned for different current prices for the bond is given in the following table:

Price (P)	Interest (RP)	Rate of interest (R = RP/P)
$110	$0	0 percent
105	5	4.8
100	10	10.0
95	15	15.8

If a borrower were able to sell a promise to pay $110 in one year for $105, then he would be paying 4.8 percent interest. If he could sell it for $95, he would be paying 15.8 percent interest.

g. Because of the inverse relationship between the price of securities and the market rate of interest, when the price of bonds adjusts in response to an excess supply of or demand for securities, the rate of interest will also adjust, but in the opposite direction. When there is an excess supply of money (i.e., an excess demand for securities), households will adjust by trying to sell securities, thereby driving the price of securities down and the rate of interest up. In summary, when there is an excess demand for money, the rate of interest will tend to rise, and when there is an excess supply of money, the rate of interest will tend to fall.

h. As can be seen in Figure 6.4 below, if the rate of interest falls when there is an excess supply of money and rises when there is an excess demand for money, then, given the level of national income, the money market will move toward equilibrium. That is, the rate of interest will adjust in a way that tends to eliminate the excess demand for or supply of money.

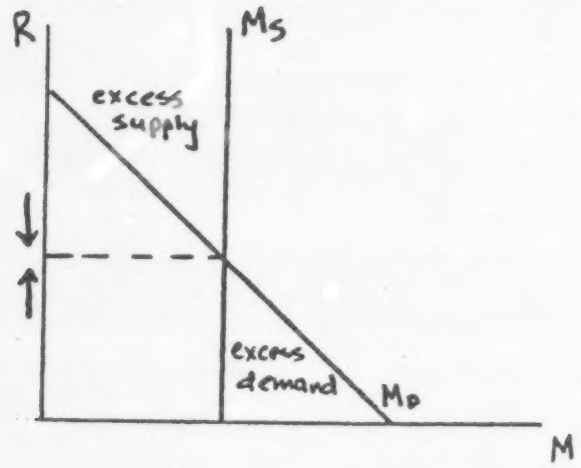


Figure 6.4

In the excess demand case, households are holding less money than they want to hold. They try to adjust by selling securities. This drives the price of securities down and the rate of interest up. At a higher rate of interest, however, households want to hold less money and more securities than they wanted to hold at the initial rate of interest. Consequently, the rise in the rate of interest has reduced the excess demand for money. If the interest rate rises sufficiently far, the excess demand will be eliminated entirely.

MACRO UNIT 7

MONEY, INTEREST, AND INCOME

7.1 General Equilibrium of Goods and Financial Markets
7.2 Monetary Policy

7. MONEY, INTEREST, AND INCOME

7.1 General Equilibrium of Goods and Financial Markets

7.1.1. Integrating the goods and money market models.

a. In Section 2 an income-expenditure model was developed which was intended to explain how thelevel of expenditure for goods and services is determined. This is a model of behavior in the "goods" market. In Section 5 the income-expenditure model of the goods market was extended to account for the dependence of investment expenditure on the rate of interest. In that section the rate of interest was treated as an exogenous variable. In terms of the algebraic representation of the model, the relationship between aggregate demand and the rate of interest can be found by solving for the reduced form equation for Y*:

$$\text{(I)} \qquad Y^* = \frac{a}{1-b} + \frac{g}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{1-b}\bar{R}$$

What this equation says is that, given the values of the other exogenous variables ($\bar{G}$ and $\bar{T}$), the higher $\bar{R}$, the lower Y* will be. This follows from the fact that the higher the rate of interest is, the lower investment expenditure will be. And, the lower investment expenditure is, ceteris paribus, the lower aggregate demand will be.

b. In Section 6, a model of the demand for and supply of money was developed which was intended to explain how equilibrium in financial markets was determined. In this model the rate of interest (R) was treated as an endogenous variable and the level of national income (Y) was treated as an exogenous variable. The solution of the financial market model can be seen in terms of the reduced form equation for R*.

$$\text{(II)} \qquad R^* = \frac{1}{n}\bar{M} - \frac{k}{n} - \frac{m}{n}\bar{Y}$$

What this equation says is that the higher the level of Y, given the value of M, the higher will be R*. This follows

from the fact that the higher national income is, the greater will be the demand for money and the higher will be the rate of interest consistent with equality between the supply of and demand for money.

c. Although the goods market and financial market models were developed separately, in the real world their equilibria cannot be determined separately. The equilibrium R which is determined in the financial market must have the same value as the R assumed to be exogenous in the goods market model. Similarly, the Y determined in the goods market must have the same value as the Y assumed to be exogenous in the money market. In other words, neither Y nor R can properly be treated as exogenous variables. What is necessary is a more general model describing behavior in both the goods and financial markets simultaneously in which both Y and R are endogenous variables.

d. This objective can be achieved by welding together the income-expenditure model from section 5 and the money demand and supply model from section 6. The structural form of this integrated model is given below in algebraic form:

(1)	$C = a + b\,Y_d$	Endogenous variables:
(2)	$Y_d = Y - \bar{T}$	C, Y_d, I, E, Y, R
(3)	$I = g + hR$	Exogenous variables:
(4)	$E = C + I + \bar{G}$	$\bar{G}$, $\bar{T}$, $\bar{M}$
(5)	$Y = E$	Parameters:
(6)	$\bar{M} = k + mY + nR$	a, b, g, h, k, m, n

e. Equations (1)-(5) are from the income-expenditure model, while equation (6) is from the money supply and demand model. It is possible, for the purposes of finding the reduced form equation for Y* for the integrated model, to summarize the structural form in terms of the two reduced form equations for the two models from which the integrated model was constructed. These are as follows:

$$(I) \qquad Y = \frac{a+g}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{1-b}R$$

$$(II) \qquad R = -\frac{k}{m} + \frac{1}{n}M - \frac{m}{n}Y$$

7.1.2. Solving the integrated model diagrammatically.

a. In order to find the equilibrium value for Y it is possible to solve the model aogebraically or diagrammatically. Either way, this can most easily be done by using equations (I) and (II) which are derived from the structural equations. Each of these equations contains the two endogenous variables R and Y. Equation (I) shows the combinations of R and Y which are consistent with equilibrium in the goods market, while equation (II) shows combinations of R and Y which are consistent with equilibrium in the financial markets. The problem is to find the combination of R and Y which is consistent with equilibrium in both markets at the same time.

b. Before using equations (I) and (II), however, it is useful to consider the following diagrammatic approach to the problem of finding the equilibrium value for Y* diagrammatically. Suppose the economy has an initial value of national income Y_0. Given Y_0, a provisional equilibrium value of the rate of interest of R_0 is determined by the supply and demand for money as in Figure 7.1a. (R_0 is a "provisional" equilibrium in the sense that the initial value for Y may not be the equilibrium value for Y. If $Y_0 = Y^*$ then $R_0 = R^*$.) For a rate of interest R_0, investment expenditure will be equal to I_0, as in Figure 7.1b. (I_0 is also a "provisional" equilibrium level of investment expenditure). Given I_0 and the values for the exogenous variables $\bar{G}$ and $\bar{T}$, a provisional equilibrium value of national income (Y_1) is determined as in Figure 7.1c.

c. If Y_1 is equal to Y_0, then, it is the final equilibrium value for Y. If it is not, then the value for Y will change from its inicial value Y_0 to Y_1. Suppose Y_0 was greater than Y_1. Then, as in Figure 7.1a, this will result in a downward shift in the demand for money curve and a change in R to R_1. The new R will determine a new investment expenditure (I_1) as in

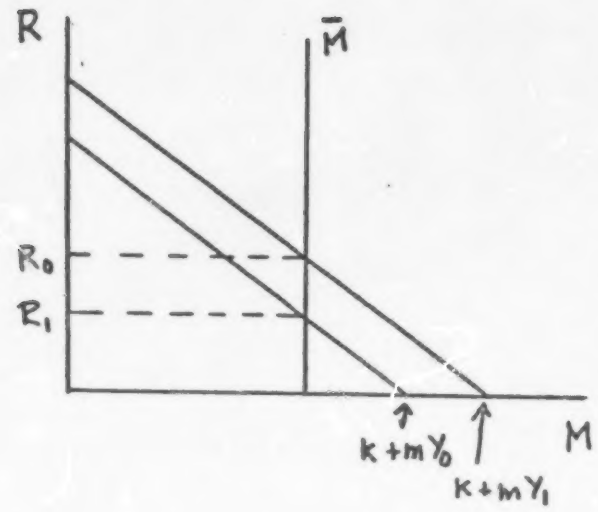


Figure 7.1a.

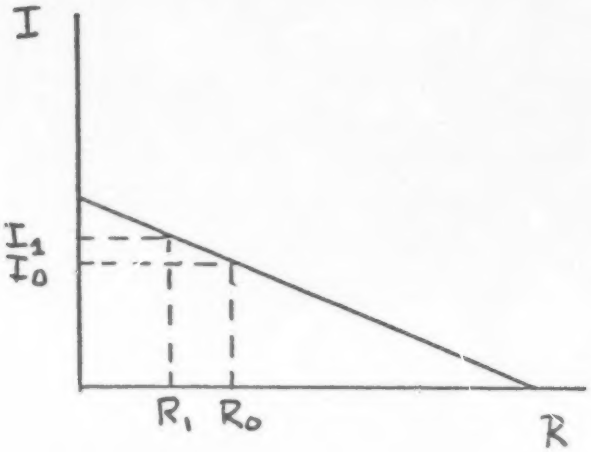


Figure 7.1b.

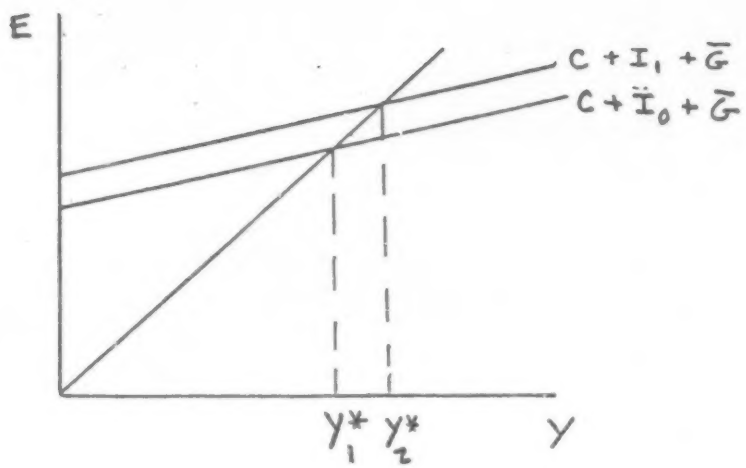


Figure 7.1c.

Figure 7.1b, which in turn will determine a new national income (Y_2) as in Figure 7.1c. Again, Y_2 must be compared with Y_1. If they are equal then the equilibrium national income will have been found. If they are not the procedures involved in working through Figures 7.1a, b and c must be repeated until the Y assumed in finding an equilibrium R in Figure 7.1a implies an identical equilibrium Y in Figure 7.1c.

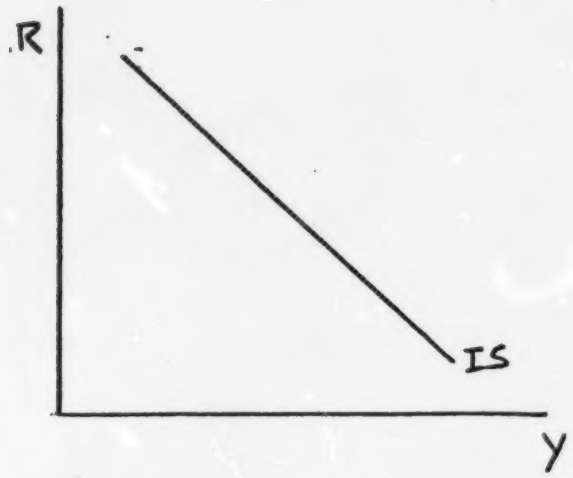
d. For reasonable assumptions it can be shown that this procedure will lead to a succession of values for Y which converges to the equilibrium Y, but this will not be demonstrated here. What the foregoing should make clear, however, is that the equilibrium value for Y depends on behavior in both goods and financial markets. This can be seen in an alternative diagrammatic approach developed in the next section.

7.1.3. An alternative diagrammatic approach.

a. In this approach equations (I) and (II) are used directly. Remember, these two equations show the combinations of R and Y which are consistent with equilibrium in the goods and the financial market. Equation (I) is found by assuming that R is exogenous in the income-expenditure model and solving for Y. Equation (II) is found by assuming Y is exogenous and solving for R in the financial market model. Now, however, R will no longer be assumed exogenous in the goods market and Y will no longer be assumed exogenous in the financial market. Both R and Y will be assumed to be endogenous in both markets. Consequently, it will be necessary to consider both equations simultaneously in order to find Y* and R*.

b. Both equations (I) and (II) can be shown diagrammatically. Consider equation (I) first. As indicated above this is an equation with two endogenous variables, R and Y. Consequently, it can be represented by a curve in a diagram in which Y is measured along one axis and R is measured along the other. In Figure 7.2 Y is measured along the horizontal axis and R along the vertical axis. It is possible to draw in the curve representing equation (I) by choosing alternative values of R

Figure 7.2.



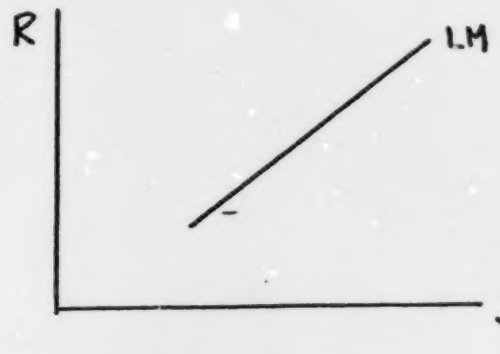
and using equation (I) to solve for the values of Y that must accompany those values of R to achieve equilibrium in the goods market. Equation (I) is shown in Figure 7.2 as the negatively sloped curve labelled IS. This curve is traditionally labelled IS because it shows the values of Y and R for which the investment (I) of firms that will occur given R equals the amount of saving (S) of households not used to finance the government deficit.

c. The IS curve is negatively sloped because the lower R is, the greater investment will be, and consequently the greater Y will be. This is consistent with the fact that the coefficient on R, i.e., $\frac{h}{1-b}$, in equation (I) is negative. The sign of $\frac{h}{1-b}$ is negative because h is negative and 1-b is positive. Since there is an inverse relationship between R and Y in the goods market income-expenditure model, the curve which shows the combinations of R and Y consistent with equilibrium in the goods market must slope downward from left to right.

d. Equation (II) can also be represented by a curve in a diagram in which Y is measured along the horizontal axis and R is measured along the vertical axis. In Figure 7.3, this curve is labelled LM, since it shows the combinations of R and Y

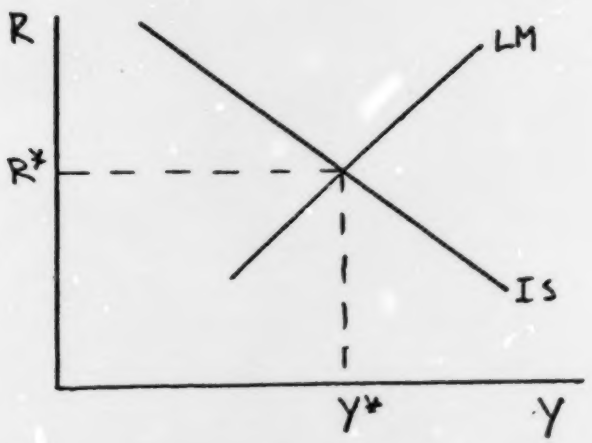
for which the demand for money (sometimes represented by the letter L) equals the supply of money (M). It can be found by choosing alternative values for Y and finding the values for R which bring about equality of the demand for and supply of money. It is positively sloped since the higher Y is, the greater the demand for money is, and consequently the higher will be R.

Figure 7.3.



e. It is possible to find the combination of R and Y which brings about equilibrium in both the goods and money markets by drawing in both the IS and LM curves in the same diagram. This is done in Figure 7.4 below. As can be seen in Figure 7.4, while there are many combinations of R and Y which are consistent with equilibrium in either the goods or money markets taken separately, there is only one combination -- given by the point of intersection -- which is consistent with equilibrium in the goods and money markets simultaneously.

Figure 7.4.



7.1.4. Solving the model algebraically.

a. Just as equations (I) and (II) can be used to find Y* and R* diagrammatically, so too can they be used to find these equilibrium values algebraically. In using the algebraic approach it should be remembered that equation (I) represents the algebraic solution to the equations of the structural form of the income-expenditure model in terms of R and Y, while equation (II) represents the algebraic solution to the financial market model in terms of R and Y. Since both equations involve both R and Y, it is possible to use them to obtain the equilibrium values R* and Y* in terms of exogenous variables and parameters alone. This is done to find Y* in the sections below.

b. By substituting the equation for R given by equation (II) into equation (I), the reduced form equation (III) can be obtained which expresses Y as a function of parameters and exogenous variables only. This procedure is carried out step by step below. First, substitute

$$\text{(II)} \qquad R = -\frac{k}{n} + \frac{1}{n}\bar{M} - \frac{m}{n}Y$$

into equation (I) as follows:

$$Y = \frac{a+g}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{1-b}\left[\frac{k}{n} + \frac{1}{n}\bar{M} - \frac{m}{n}Y\right]$$

$$= \frac{a+g-hk/n}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{(1-b)n}\bar{M} - \frac{hm}{(1-b)n}Y$$

c. Second, use the resulting equation to solve for Y in terms of parameters and exogenous variables only by adding $\frac{hm}{(1-b)n}Y$ to both sides of the equation, which leaves:

$$Y + \frac{hm}{(1-b)n}Y = \frac{a+g-hk/n}{1-b} - \frac{b}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{(1-b)n}\bar{M}$$

d. By factoring out Y from the left-hand side, as follows:

$$Y\left[1 + \frac{hm}{(1-b)n}\right] = \frac{a+g-hk/n}{1-b}\bar{T} + \frac{1}{1-b}\bar{G} + \frac{h}{(1-b)n}\bar{M}$$

and multiplying both sides by $\frac{1-b}{1-b-hm/n}$ results in the following expression for Y:

$$\text{(III)} \quad Y^* = \frac{a+g-hk/n}{1-b+hm/n} - \frac{b}{1-b+hm/n}\bar{T} + \frac{1}{1-b+hm/n}\bar{G} + \frac{h/n}{1-b+hm/n}\bar{M}$$

e. The final result then is a complicated looking equation which gives the equilibrium value of national income in terms of the model's exogenous variables ($\bar{G}$, $\bar{T}$, and $\bar{M}$) and parameters (a, b, g, h, k, m, and n). If the values of the parameters are known it is possible to use the reduced form equation to obtain a forecast of Y* for any given combination of policy instruments $\bar{G}$, $\bar{T}$, and $\bar{M}$. As was mentioned previously, one of the major aspects of economics research is to obtain estimates of parameters of models such as the one analyzed here. And, a considerable amount of disagreement about the effect of policy variables on Y* stems from disagreement about what these values are.

7.1.6. The government expenditure and tax multipliers.

a. Inspection of equation (III) indicates that the $\bar{G}$ and $\bar{T}$ multipliers are different from what they were in the simpler model. Consider first the government expenditure multiplier:

$$\frac{1}{1-b+hm/n}$$

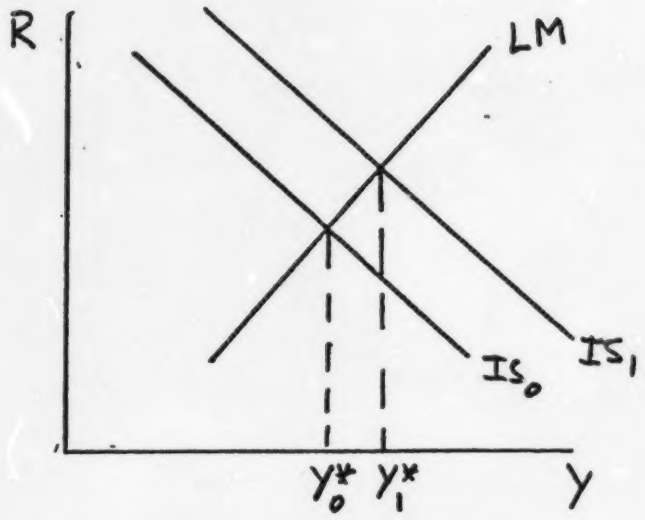
In the simplest model of income and expenditure the $\bar{G}$ multiplier was 1/(1-b). Now the denominator has another term, hm/n. As in the money supply multiplier, this term reflects the changes in the rate of interest and investment expenditure induced by changes in Y_0.

b. Since h and n are both negative, the term hm/n is positive. Since 1-b is positive, this means that the entire expression $\frac{1}{1-b-hm/n}$ is positive. That is, in this model as in previous models, an increase in government expenditure will lead to an increase in aggregate demand.

c. The presence of the additional term in the denominator, however, means that the size of the multiplier will not be the same as in the simplest model. Because the term hm/n is positive, its presence will make the denominator larger and, therefore, the multiplier smaller. This means that taking into account the effects on the money market and subsequent induced effects on income and expenditure flows leads to a smaller $\bar{G}$ multiplier than is obtained by ignoring them.

d. These results can also be seen in diagrammatic terms by considering the IS and LM curves in Figure 7.7 below. The IS and LM curves prior to a change in $\bar{G}$ or $\bar{T}$ are indicated by IS_0 and LM_0. These produce an equilibrium Y of Y*. The effect of an increase in $\bar{G}$ is to shift the IS curve to the right by an amount equal to $\frac{1}{1-b}$ times the increase in $\bar{G}$. That is, given R, an increase in G will cause an increase in the equilibrium Y of an amount equal to the simple multiplier times the increase in $\bar{G}$. The same shift in the IS curve could be achieved by a larger decrease in $\bar{T}$, because the tax multiplier, $-\frac{b}{1-b}$, is opposite in sign and smaller in absolute value than the government expenditure multiplier. The effect of the increase in $\bar{G}$ (or decrease in $\bar{T}$) on Y* is to produce a smaller increase than would be predicted by ignoring the interaction of the goods and financial markets. That is, the increase in Y* brought about by the shift in the IS curve is not as great as the shift in the IS curve. This is because one effect of the shift in the IS curve is to induce a decrease in I which partially offsets the increase in $\bar{G}$ (or decrease in $\bar{T}$).

Figure 7.7.



7.2. Monetary Policy.

7.2.1. The money supply multiplier.

a. The reduced form equation (III) consists of a constant term plus the exogenous variables each multiplied by a coefficient. These coefficients are called multipliers because they show by how much changes in the exogenous variables must be multiplied to obtain the effect of these changes on the equilibrium level of national income. The value of each multiplier depends on the parameters of the structural form of the model. The reason why each multiplier involves parameters from more than one equation of the structural form is the same reason why finding Y* using the diagrammatic approach was so awkward, i.e., Y* is determined simultaneously by all of the structural equations in the model and their interactions must be taken into account if the true equilibrium is to be found.

b. The money supply multiplier shows the effect of a change in the money supply on the equilibrium value of national income. From equation (III), it can be seen that its value is equal to:

$$\frac{h/n}{1-b-hm/n}$$

The first question to ask about this multiplier is whether it is positive or negative. If it is positive, then an increase in $\bar{M}$ will lead to an increase in Y*. If it is negative, then an increase in $\bar{M}$ will lead to a decrease in Y*. Since the multiplier takes the form of a fraction, it will be positive if both the numerator and denominator have the same sign. Consider the numerator first. It is itself a fraction, i.e., a ratio of the parameters h and n, h being the effect of a change in R on investment expenditure and h being the effect of a change in R on the demand for money. Both of these parameters are negative, and the numerator is, therefore, positive. Consider now the denominator. Since b, the marginal propensity to consume is positive but less than one, it follows that 1-b is positive. The term hm/n is also positive since h and n are both negative and m is positive. Therefore, the denominator is positive. Since the numerator and denominator are both positive, the money supply multiplier is positive. This makes intuitive sense based on the previous discussion of the structural equations of the model. An increase in $\bar{M}$ should lead to a lower R, which in turn will result in a higher I, which will, finally, produce a higher Y.

c. How large will the money supply multiplier be? The answer to this, of course, depends on the values of the parameters. The parameter h is the amount of increase in investment expenditure per unit decrease in R, while 1/n is the amount of decrease in R per unit increase in M, holding Y constant. Consequently, the numerator h/n shows how much of an initial or first round increase in I there will be per dollar increase in M.

d. As in the models considered previously, however, there are subsequent or second round effects to take into account. These are reflected in the denominator. The parameter b, of course, takes into account the effect on consumption resulting from the increase in Y induced by the increase in I, just as was the case in the earlier, simpler models. In this model, however, the denominator has another term, i.e., hm/n. This term takes into account what made the first diagrammatic approach in Section 7.1.2 so complicated. That is, it reflects a partially

offsetting decrease in investment caused by the increase in Y induced by the initial increase in I. This decrease in I is the result of the following chain of events: the higher Y causes a greater demand for money due to the transactions motive (accounted for by the parameter n); finally this causes a lower level of investment (accounted for by the parameter h). Thus, the denominator takes into account all of the subsequent effects of the initial increase in investment expenditure caused by the increase in $\bar{M}$: both the induced increases in C and the induced decreases in I.

e. When interpreting the money supply multiplier of the reduced form equation for Y*, it is helpful to consider once again the diagrammatic approach. Suppose the economy to be initially in equilibrium, as in Figures 7.5a, b and c, with the money supply equal to $\bar{M}_0$, the rate of interest at R_0, investment expenditure at I_0, and national income at Y_0*. Now consider the effect of an increase in the money supply to the level $\bar{M}$. Initially, as in Figure 7.5a, this will result in a fall in R to R_1 and, as in Figure 7.5b, increase I to I_1. This initial change in I is what is reflected in the numerator of the money supply multiplier.

f. The initial increase in I will result in an increase in Y to Y_1 as in Figure 7.5c. This increase in Y reflects the initial increase in I plus the induced increases in C, but it does not take into account the effect of the induced increase in $\bar{R}$ and decrease in I. That is, the increase in Y to Y_1 in Figure 7.5c is what is reflected in the term 1-b in the denominator of the multiplier. It is necessary however, to also take into account the term mh/n in the denominator. This can be done by shifting the demand for money curve in Figure 7.5a, then tracing through the effects of that shift on R, I, and Y, and repeating the process until the equilibrium Y is found, i.e., until a Y is found which gives a demand for money curve and R in Figure 7.5a and an I in Figure 7.5b that gives the same Y in Figure 7.5c. The change in Y from Y_0 to the equilibrium Y that this iteration procedure converges to is what the money supply multiplier gives directly.

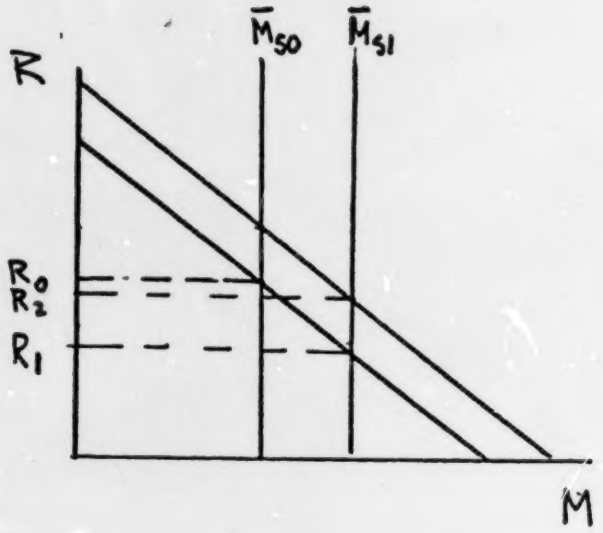


Figure 7.5a.

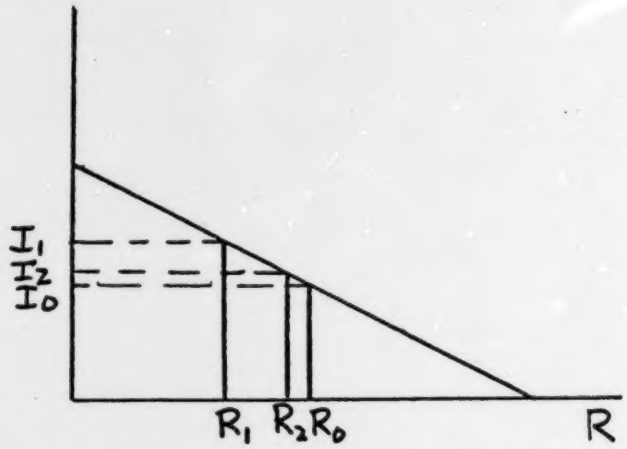


Figure 7.5b.

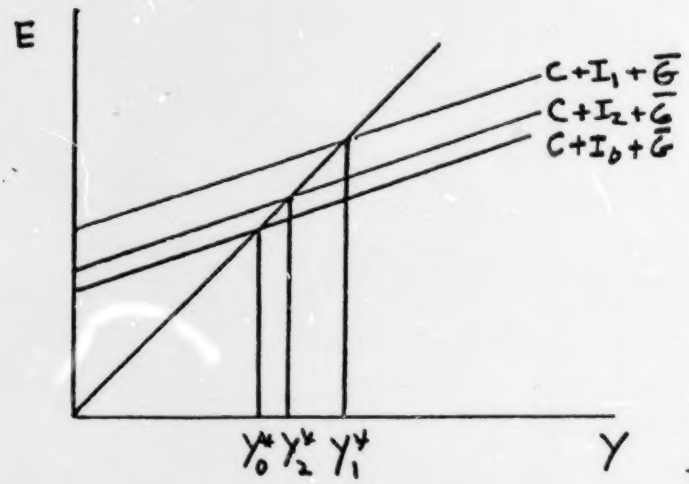
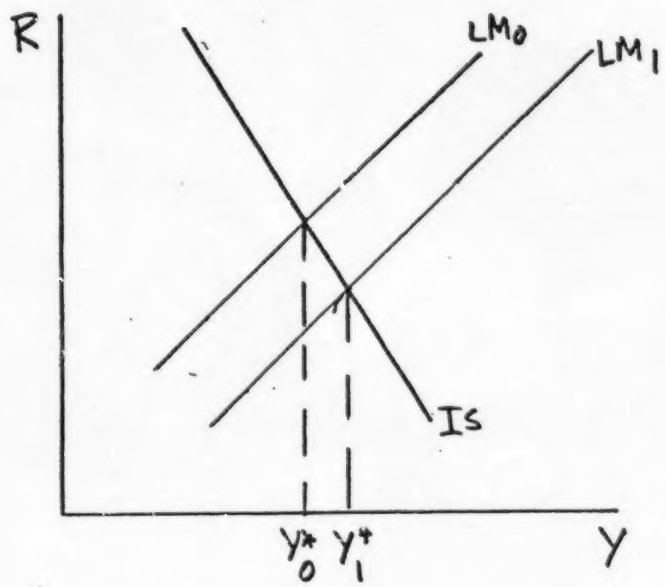


Figure 7.5c.

g. This can also be seen diagrammatically in terms of the IS and LM curves as in Figure 7.6 below. The effect of an increase in the money supply is to shift the LM curve downward to the right. This is because an increase in the money supply, for any given level of Y, will result in an excess supply of money at the R which produced an equilibrium in the money market at that level of Y. Consequently, for any given level of Y, the value of R which will produce an equilibrium with the higher $\bar{M}$ will be lower. That is, the new LM curve will be below, or to the right of, the initial LM curve. The effect of a shift of the LM curve to the right is to increase Y*. The amount of the increase in Y* as a result of the shift in the LM curve due to an increase in $\bar{M}$ in Figure 7.6 is the same as is implied by the money supply multiplier times the change in $\bar{M}$ from equation (III).

Figure 7.6.



7.2.2. The creation of money.

a. As was discussed in Section 6.2 the supply of money is composed of liabilities of financial intermediaries. The currency component of the money supply — Federal Reserve Notes -- is the liability of the Federal Reserve and the bank deposit component is the liability of the financial intermediaries which issued it, it is the asset of those who hold it.

b. The way in which liabilities of financial intermediaries are created, is through the purchase of securities by the financial intermediaries. When either the Federal Reserve or a commercial bank buys a security it pays for it by issuing a new liability. For example, if a bank lends to a home buyer, i.e., buys a security called a mortgage issued by the home buyer, it creates a bank deposit in that borrowers name, i.e., pays for the security by issuing a new liability which is called money.

c. The money supply is considered to be exogenous in the model developed in Section 7.1 because the Federal Reserve is assumed to take whatever action is necessary to bring about the supply of money it wants in existence. Its actions in bringing about an increase in the money supply consist of purchasing securities itself, inducing private financial intermediaries to purchase securities, or both. Whenever a financial intermediary purchases a security it results in the creation of a liability of that intermediary, i.e., an increase in the money supply.

d. A decrease in the supply of money is brought about by the sale of a security (which might take the form of a loan repayment, for example) The purchaser of the security from the Federal Reserve or the private banking system must pay for it with money, i.e., either with currency or a check drawn against deposit account. This represents a reduction in the amount of financial intermediaries' liabilities outstanding, i.e., a reduction of the money supply.

7.2.3. Open market operations.

a. The principal instrument of monetary policy of the Federal Reserve is the purchase or sale of securities by the Federal Reserve itself.

This is called open market operations. An open market purchase of securities results in the creation of new Federal Reserve liabilities as the Federal Reserve creates them (for example, prints FR Notes) to pay for the securities it purchases. An open market sale of securities results in the elimination of some Federal Reserve liabilities as the Federal Reserve receives payment in the form of liabilities it created in the past.

b. An open market purchase or sale of securities, therefore, has a direct effect on the money supply. It also has an indirect effect as it leads to additional purchases or sales of securities by the private banking system. Take the case of an open market purchase. As a result of the open market purchase new Federal Reserve liabilities are created. If some of these are deposited in banks, this provides banks with additional funds which it can use to purchase securities. As a result of bank purchases of securities additional money in the form of bank deposits are created. The final result is an increase in the money supply which is greater than the initial purchase of securities by the Federal Reserve.

c. The amount of additional securities banks can purchase as a result of an increase in deposits is limited by the requirement imposed by the Federal Reserve on banks that a certain fraction of their deposits be backed up by bank holdings of Federal Reserve liabilities in the form of either Federal Reserve Notes or the banks' deposit accounts in the Federal Reserve. If the required ratio of reserves to deposits is 20 percent, for example, this means that 20 percent of banks total deposits must be matched by banks holdings of Federal Reserve liabilities. This also means that banks can hold securities in an amount that does not exceed 80 percent of deposits.

d. The effect of open market operations on the money supply can be seen clearly in terms of the balance sheets of the household sector, the Federal Reserve, and the banking system. The first set of accounts shows the situation with respect to financial assets and liabilities prior to an open market purchase of securities by the Federal Reserve.

Households

Assets		Liabilities	
Federal Reserve Notes	200		
Bank Deposits	1000		
Securities	1500		

Federal Reserve

Assets		Liabilities	
Securities	400	Federal Reserve Notes	200
		Banks' Deposits in FR	200

Banking System

Assets		Liabilities	
Deposits in FR	200	Deposits of Households	1000
Securities	800		

In this situation the money supply is 1200, i.e., the sum of currency and deposits held by the non-bank public (households). Banks back up 20 percent of their deposits with reserves, thereby satisfying an assumed required reserve ratio of .20.

e. If the Federal Reserve were to change the initial situation by purchasing 10 securities from households and households chose to hold all of the new Federal Reserve Notes created to pay for the securities, the result would be as follows:

Households

Assets		Liabilities
Federal Reserve Notes	210	
Bank Deposits	1000	
Securities	1190	

Federal Reserve

Assets		Liabilities	
Securities	410	Federal Reserve Notes	210
		Banks' Deposits in FR	200

Banking System

Assets		Liabilities	
Deposits in FR	200	Deposits of Households	1000
Securities	800		

f. If, however, households chose to deposit in banks some of its proceeds from selling securities to the Federal Reserve, then the situation would change even more. If households deposited half of its Federal Reserve Notes in banks then the banking system balance sheet would appear as follows:

Banking System

Assets		Liabilities	
Federal Reserve Notes	5	Deposits	1005
Deposits in FR	200		
Securities	800		

In this situation it would have reserves of 205 which would equal approximately 20-1/2 percent of its deposits. That is, the banking system would have excess reserves. Since it does not earn interest on securities, it would be to the banks' advantage to buy securities and pay for them by creating new deposit accounts on behalf of the seller of those securities until its excess reserves are eliminated.

g. The final effect of this expansion of the banking system can be seen in the new balance sheets:

Households

Assets		Liabilities	
Federal Reserve Notes	205		
Deposits	1025		
Securities	1170		

Federal Reserve

Assets		Liabilities	
Securities	210	Federal Reserve Notes	210
		Banks' Deposits	200

Banking System

Assets		Liabilities	
Federal Reserve Notes	5	Deposits	1025
Deposits in FR	200		
Securities	820		

As a consequence of the Federal Reserve purchase of securities in the amount of 10, the end result was an increase in the money supply of 30. This occurred because part of the money created directly by the Federal Reserve was deposited in banks by households which made it possible for the banking system to expand its holdings of securities and its outstanding liabilities (deposits).

7.2.4. Other policy instruments of the Federal Reserve.

a. Because banks would prefer to hold as many of their assets in an income earning form, i.e., in securities, any time they are faced with excess reserves they will tend to buy more securities and thereby create new deposits. Because the Federal Reserve controls the reserve requirements of banks, it can influence the amount of deposits in banks by changing the required reserve ratio. By decreasing the ratio, the Federal Reserve can create excess reserves and thereby encourage banks to expand their assets and liabilities.

By raising the required reserve ratio, the Federal Reserve can force a contraction of the banking system. Either way, the Federal Reserve can use the required reserve ratio as means to controlling the money supply and, thereby, the level of aggregate demand.

b. It is possible for banks to meet their legal reserve requirement by borrowing reserves from the Federal Reserve. The rate of interest the Federal Reserve charges banks that borrow reserves from it is called the discount rate. By changing the discount rate the Federal Reserve can encourage or discourage borrowing by banks as a means of meeting their reserve requirement. When the Federal Reserve lends reserves to the banking system, it permits a greater level of deposits and security holdings than would otherwise be the case. Consequently, the Federal Reserve can influence the money supply through its control of the discount rate.

c. In managing the money supply, the Federal Reserve relies primarily on open market operations. Changes in reserve requirements and in the discount rate are not typically used as the means to change the money supply. Whatever instruments are used, however, the effect of the change in M which the Federal Reserve brings about is identical. The higher M is, the lower R is, the higher investment is and the greater the level of aggregate demand.

MACRO UNIT 8

AGGREGATE SUPPLY

8.1 The Labor Market
8.2 The Phillips Curve

LECTURE NOTES

8. The Labor Market

8.1. The Supply and Demand for Labor

8.1.1. Labor supply

a. A number of factors influence the amount of labor that people are willing to make available for use in production in any given time period. The most obvious factor is the population of working age. The more working age people there are, ceteris paribus, the greater will be the number of people willing to work. In the short run, i.e., for any given time period, the size of the working age population will be given. Consequently, for the purposes of this analysis, this factor will be considered to be predetermined or given.

b. The official definition of the labor supply is the number of people employed plus the number of people unemployed <u>who are</u> actively seeking work. One factor affecting the number of unemployed who actively seek work is the difficulty involved in finding a job. Typically, a percentage of unemployed workers who want to work become discouraged when jobs are hard to find and stop looking for a job. Since unemployed persons who are not actively seeking work do not count in the official labor force measure, the measured labor force falls when unemployment increases. This is one reason why Okun's Law shows that when the unemployment rate goes up by one percentage point, the output gap goes up by 3 percentage points. That is, measured unemployment rises more slowly than true unemployment rises when aggregate demand falls below potential GNP, because discouraged unemployed workers drop out of the labor force as officially defined.

c. A distinction can be made between the labor supply at full employment and the actual labor supply because of the discouraged work phenomenon. For the purposes of this section, the focus will be on the full employment or <u>potential labor supply</u>. This concept is a better measure of the labor force potentially available because it includes those workers who want to work but do not expect to find one, and therefore are not actively searching for a job.

d. -- A third factor affecting labor supply is the wage rate. Theoretically, there are two effects of the wage rate on the labor supply. One effect is that a higher wage rate results in a higher income which tends to reduce the amount of labor supplied. The other effect is that a higher wage rate means that, given income, an extra hour of work is more attractive in terms of financial remuneration which tends to increase the amount of labor supplied. Since it is unclear which way an increase in the wage rate will affect labor supply, it will be assumed that the labor supply is unaffected, in the short-run at least, by the wage rate.

e. Given the assumption that the short-run supply of labor does not depend on the wage rate, the potential labor supply curve (LS) can be constructed as in Figure 8.1 below. This curve is vertical because of the assumed short-run insensitivity of labor supply (L) to the wage rate (W).

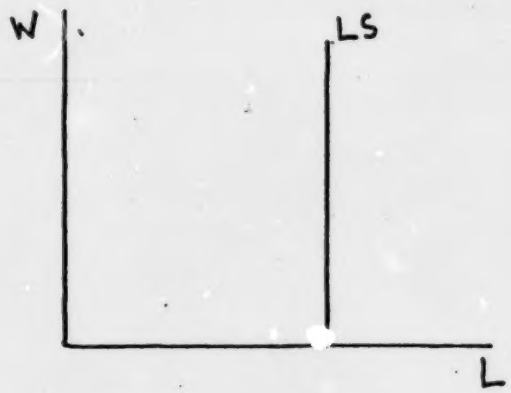


Figure 8.1

8.1.2. Labor Demand

a. An analysis of the demand for labor is concerned with the behavior of producers in deciding how much labor to employ. Since this course is concerned with macroeconomic behavior in the short-run, the questions is what factors influence the demand for labor by producers in a given period. This means that the quantity of capital goods that producers have available for use in production must be treated as given, becuase the stock of capital goods is pre-determined by past net investment and current investment can only affect the future stock of capital goods.

b. -- It will be assumed here that producers will hire as much labor as is required to produce the amount of output for which there is a demand. That is, given the amount of capital they have, producers' demand for labor in the short-run depends on aggregate demand. This can be represented diagrammatically as the vertical curve LD in Figure 8.2 below. Regardless of the wage rate, the amount of labor demanded by firms will be the quantity given by the labor demand curve.

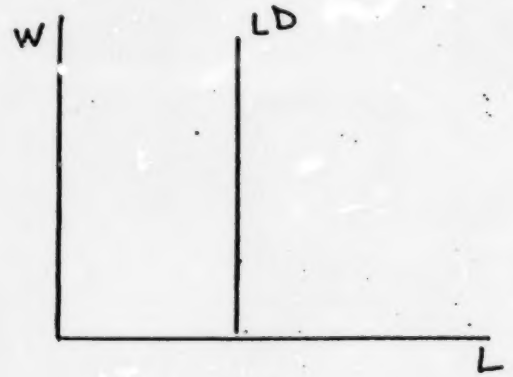


Figure 8.2

c. The demand curve can be put together with the supply curve to give a diagrammatic representation of the labor market as in Figure 8.3 below. If the LD curve is to the left of the LS curve, the result will be unemployment as in Figure 8.3a. If it is to the right of the LS curve, the result will be "overemployment", i.e., the unemployment rate will be below normal full employment unemployment rate and there will be more than the usual amount of overtime.

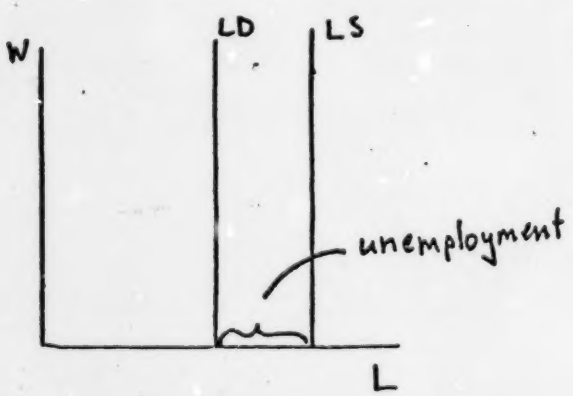


Figure 8.3a

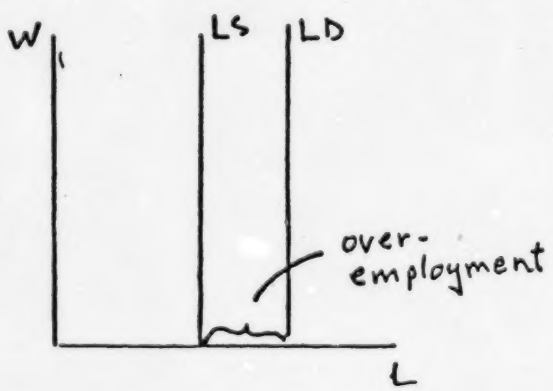


Figure 8.3b

d. Only if labor demand and potential labor supply are equal will the labor market be in equilibrium. This would occur if the LD and LS curves were in identical positions. This could be achieved through government policy if monetary and fiscal policy was used to create a level of demand for output such that the resulting labor demand was coincidental with the potential labor supply

8.1.3. Wage adjustment in the labor market.

a. If the labor market functioned perfectly, it would be expected that wages would rise when there is an excess demand for labor and fall when there is excess supply of labor. The effect of that would be to increase or decrease the cost of production and, therefore, the price of output that producers would charge. Consequently, if the labor market functioned perfectly, it would be expected that wages and prices would fall when there was unemployment and rise when there is overemployment.

b. What would be the effect of the price changes induced by these wage changes? Earlier in analyzing the determination of aggregate demand the price level was assumed to be constant. If one allows for the possibility that the price level might vary, it will be necessary to allow for the possibility that aggregate demand depends on the price level.

c. The higher the price level, the greater will be the amount of money required for transactions purposes. Consequently, the demand for money will vary positively with the price level. The higher the price level the greater will be the demand for money. Given the supply of money, the higher the rate of interest will be, the lower investment expenditure will be and, consequently, the lower aggregate demand will be. That is, the higher the price level, the lower aggregate demand will be.

d. Consequently, if the labor market worked perfectly so that the wage rate would fall when there was unemployment and rise when there was overemployment, then the economy could be expected to move automatically toward full employment. If there was unemployment, the wage rate would fall, the price level would fall, aggregate demand would increase,

the demand for labor would increase and unemployment would decrease. If there was overemployment, the wage rate would rise, the price level would rise, aggregate demand would fall, the demand for labor would fall, and the overemployment would be eliminated.

e. To a great extent this mechanism works when there is overemployment or excess aggregate demand. In this situation, prices rise rapidly and the unemployment rate does not remain above the normal full employment rate for long. This is why, except for World War II when prices were controlled by the government, there have been no extended periods of over employment.

f. The wage-price mechanism does not work very effectively to eliminate unemployment. The existence of downward wage rigidity due to government regulation (e.g., minimum wage laws) and private agreements (e.g., labor contracts) prevent the wage rate from falling significantly in response to an excess supply of labor. As a result, periods of unemployment tend to be prolonged and a greater reliance must be placed on monetary and fiscal policy to raise aggregate demand when there is unemployment.

8.2. The Phillips Curve

8.2.1. Demand pull inflation.

a. In Section 3 the relationship between aggregate demand and inflation was developed. The conclusion reached was that the rate of inflation depended on the relationship between aggregate demand and potential GNP. The greater aggregate demand is relative to potential GNP, the higher will be the rate of inflation. Inflation which results from too much aggregate demand is called <u>demand pull inflation</u>.

b. When there is demand pull inflation the way to solve the problem is to reduce aggregate demand. To a great extent demand pull inflation is self eliminating. As the price level rises aggregate demand decreases and the inflation rate falls. If policy makers do not want to rely on the inflation to eliminate itself, or if they foresee too too much aggregate demand in the future, they can eliminate or prevent the demand pull inflation by using monetary and fiscal policy to reduce aggregate demand.

c. Because of the inflationary bias in the economy, the rate of inflation that there will be when the economy is at full employment is not zero, but is positive. That is, the inflation that is due to excess aggregate demand that can be strictly called demand pull inflation is the amount of inflation in excess of the inflation that would occur at full employment. If, for example, the full employment inflation rate was 2 per cent and the inflation rate was 5 percent because aggregate demand was greater than potential GNP, then demand pull inflation would be 3 percent.

8.2.2. Cost-push inflation

a. Sometimes inflation results from factors unrelated to excess demand. One such factor is a change in the cost of production unrelated to the level of demand. It was shown earlier that a rise in the wage rate due to an excess demand for labor would cause a rise in the cost of production and, therefore, a rise in the price level. But such a rise in the price level is due to excess demand. Costs of production can rise for reasons unrelated to the level of aggregate demand relative to potential GNP. Inflation due to a rise in the cost of production is called cost-push inflation.

b. One factor which could cause cost-push inflation would be a rise in the price of imported goods such as resulted from the increase in the price charged by OPEC for petroleum and the devaluation of the dollar. As the price of imported goods rises the cost of production rises irrespective of demand for output.

c. Another factor which could cause cost-push inflation is a reduction in productivity due to such events as poor weather conditions which might result in low crop yields, slowed transportation, or other losses in production resulting from a given input of factors of production. As productivity falls, the cost per unit of output increases and the result is an increase in price.

8.2.3. Inflationary expectations

a. Since many prices are set at the beginning of a period of time to apply for the entire period, it is of interest to firms's setting the price of their output to know what will happen to costs later on in the period. If firms expect costs to rise during the period,

then they will set the price higher in the beginning of the period to cover the expected increase in costs.

b. Similarly, workers in bargaining for a wage which will apply over a year or more, will want to know what will happen to the prices of goods they will buy throughout the period. If they expect prices to rise during the period, then they will bargain for a higher wage now. This will have the effect of raising costs and, therefore, prices in the present.

c. As the two preceeding cases make clear, the expectation of price increases in the future can cause prices to rise in the present. That is, the expectation of inflation can actually cause inflation. Frequently, inflationary expectations occur after a period of demand-pull inflation. During a period of demand-pull inflation prices rise because of excess aggregate demand. This leads workers and producers to expect inflation in the future as well. Even after the excess demand is eliminated, if people continue to expect inflation, the result will be more inflation.

MACRO UNIT 9

INTERNATIONAL MACROECONOMICS

9.1 The Balance of Payments
9.2 The Income-Expenditure Model with Foreign Trade
9.3 International Monetary Arrangements

9. INTERNATIONAL MACROECONOMICS

9.1. The Balance of Payments

9.1.1. The market for foreign exchange

a. When a buyer in the United States wants to make a purchase in another country, he first buy some of the currency of that country. Similarly, when a foreigner wants to buy something in the U.S., he must fir[illegible] buy dollars.
The market in which people buy and sell different national currencies is called the foreign exchange market. For example, if an English importer wants to buy a computer in the United States, he will first have to buy dollars in the foreign exchange market. Of course, at the same time he will be selling pounds (the British currency) in the foreign exchange market.

b. Like any other market, the foreign exchange market is subject to the forces of supply and demand. That is, if the demand for a currency increases, we can expect the price of that currency in terms of other currencies to increase. Similarly, when the supply of currency increases, we can expect the price of that currency to fall.
In the following discussion suppose there were only two currencies: the U.S. dollar and the British pound. The price of the dollar is the number of pounds you must pay to buy it. And the price of the pound is the number of dollars you must pay for it. These prices are called exchange rates. In 1975, the exchange rate between dollars and pounds was $2.00 to the pound. That is, the price of a pound was 2.00 dollars and the price of a dollar was about .50 pounds.

c. The number of dollars that people want to sell in exchange for pounds is the supply, and the number of dollars people want to buy with pounds is the demand. Because people will want dollars to buy goods in the U.S., the greater the amount of goods foreigners want to buy from the U.S., the greater the demand for dollars. And the greater the quantity of foreign imports Americans want to buy, the greater the supply of dollars.

d. Consider what is likely to happen if the price of dollars increases. This means that foreigners are going to have to pay more pounds to obtain a dollar and, consequently, in terms of pounds American goods will be more expensive. Because a higher price for U.S. goods means fewer will be bought, a higher price for dollars will mean a smaller demand for dollars.

e. A higher price for dollars also means that Americans can obtain more pounds with a dollar. This means that British goods will be less expensive in terms of dollars, and Americans will want to import more British goods. As long as the elasticity of demand for British goods is greater than one, that is, as long as the dollar price times quantity bought increases when the dollar price falls, the supply of dollars will increase.

f. The supply (SS) and demand (DD) curves for dollars are shown in Figure 9.1. These show that as the value of the dollar increases in terms of pounds, the quantity supplied increases and the quantity demanded decreases. Where the two curves intersect, the quantities supplied and demanded will be equal.

As long as there is a free market for foreign exchange, we can expect the exchange rate to adjust to the level where the quantities supplied and demanded are equal. When there is a free market for foreign exchange, we say that there are <u>flexible exchange rates</u>.

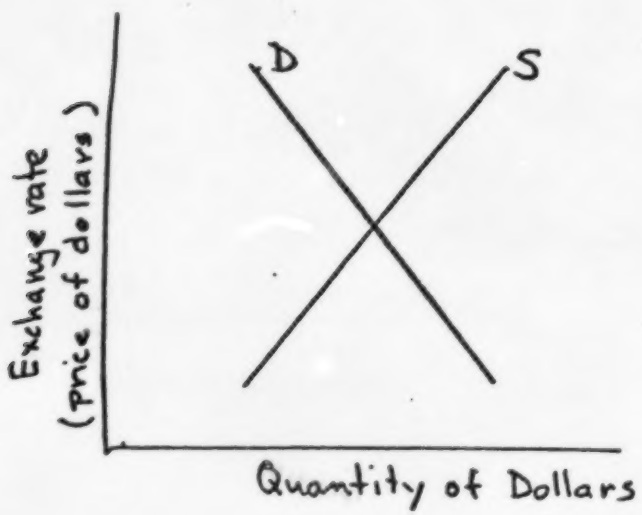


Figure 9.1

9.1.2. Fixed exchange rates.

a. Until recently, we did not have a system of flexible exchange rates. That is, the exchange rates were not allowed to adjust to levels where the quantities supplied and demanded would be equal. When exchange rates are not free to equate supply and demand, there is a fixed exchange rate system. Under a fixed exchange rate system, the governments of the various currencies agree to buy or sell sufficient quantities of their currencies to keep the exchange rate at an agreed-upon value. In terms of Figure 9.2, the free market equilibrium exchange rate is p_3. But suppose the U.S. government intends to keep the exchange rate at p_1 instead. At p_1, the quantity demanded exceeds the quantity supplied by the amount cd. In order to keep the price from moving from p_1 to p_3, the U.S. government would have to sell dollars in the amound cd in exchange for pounds.

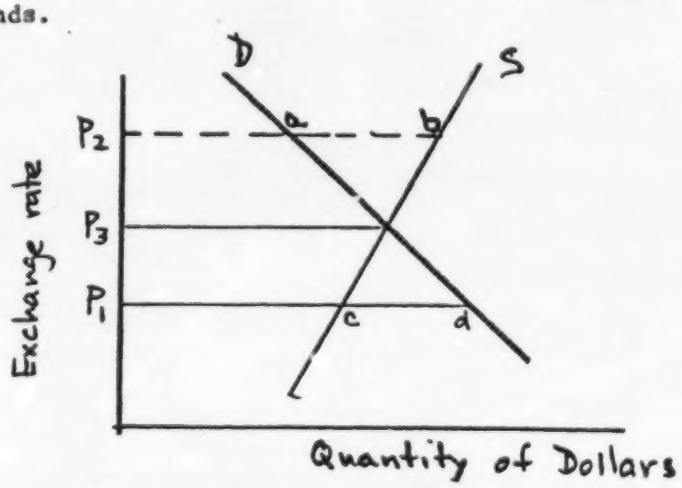


Figure 9.2

b. What if the U.S. government had wanted to fix the exchange rate of p_2? At that price, the quantity demanded would be smaller than the quantity supplied by the amount ab. In order to prevent the exchange rate from falling to the free market equilibrium of p_3, the government would have to buy dollars and pay for them with pounds.

c. Notice that whenever there is an excess demand for dollars, the U.S. government can satisfy the demand for dollars at the fixed exchange rate without any trouble. This is because through borrowing or taxing

it can always obtain enough dollars to sell in the foreign exchange market. But, when there is an excess supply of dollars at the fixed exchange rate, the government will only be able to maintain that exchange rate if it has ample reserves of pounds. If it does not have ample reserves of pounds, it will not be able to buy enough dollars to eliminate the excess supply of dollars at the fixed exchange rate.

d. If the U.S. government ran out of reserves, there would be at least two possible ways to eliminate the excess supply of dollars. One would be to borrow pounds from the British government and use those pounds to purchase the excess supply of dollars. The other would be to persuade the British government to buy the dollars to eliminate the excess supply. Obviously, limits exist to both of the above. As we shall see later, foreign governments will be unwilling to lend to the U.S. or accumulate dollars indefinitely if there is an excess supply of dollars year after year. And it is highly unlikely that a nation would loan money to another nation forever or be prepared to purchase another nation's currency ad infinitum.

e. In the real world, of course, there are many currencies and many exchange rates. But the market for each currency operates just like the market for dollars we have described. Until recently there was one special currency, however, that was not the national currency of any country, namely gold. For many years prior to 1971, the United States agreed to exchange gold for dollars at a fixed price of $35 per ounce. That is, the U.S. agreed to fix the exchange rate between dollars and gold. In order to do that, it had to stand ready to buy gold whenever there was an excess supply of gold at that price and to sell gold whenever there was an excess demand for gold at that price.

f. This arrangement also obligated the U.S. government to exchange gold for dollars whenever asked to by a foreign government, which might, for example, have acquired dollars in the process of maintaining the fixed exchange rate between its currency and the dollar. In order for the fixed exchange rate between the dollar and gold to be maintained, the U.S. had to have ample reserves of gold, so that it could stand ready to sell gold whenever there was an excess demand for gold at the price of $35 per ounce.

9.1.3. The balance of payments

a. The U.S. balance of payments shows the quantities of dollars supplied and demanded as a result of all international transactions involving the United States. All items that added to the supply of dollars are recorded with a minus (-) sign, and all items that added to the demand for dollars enter with a plus (+) sign. Consequently, you would expect to see the entry for exports to have a + sign and the entry for imports have a - sign. If the U.S. had $40 billion in exports and $40 billion in imports and no other international transactions, its balance of payments would look like this:

Exports	+ $40 billion
Imports	- $40 billion
Balance	0

b. What if, at the initial exchange rate, there were $40 billion in exports and ₱30 billion in imports and no other private international transactions? Under our pre-1971 system, there would be an excess supply of dollars, and in order to maintain the value of the dollar at the agreed upon rate the U.S. government would have to sell gold or in other words buy dollars. Under our present system, unless the U.S. government chose to buy dollars with its reserves of other countries' currencies, or unless some other country's government or unless some other country's government chose to buy dollars with its currency, the price of the dollar would decline. Under the fixed exchange rate system, the balance of payments would look like this:

Exports	+ 40
Imports	- 30
Balance on goods and services	+ 10
Decrease in reserves	- 10
Balance	0

c. Notice that when the U.S. adds to its reserves it enters the balance of payments with a - sign because when the U.S. buys reserves, just as when it buys goods, it adds to the supply of dollars. Notice also that under the fixed exchange rate system because the balance of payments includes official transactions undertaken to offset an excess demand or supply of dollars resulting from regular transactions,

the balance is always equal to zero. That is, because official transactions that are taken to equate supply and demand for dollars at the fixed exchange rate are included, the balance of payments always balances. Under a flexible exchange rate system, the price of dollars will adjust so that the supply of and demand for dollars are equal without any official transactions.

d. If the balance of payments always balances, what is meant by the balance of payments deficit or surplus? These concepts are important only in a fixed exchange rate system. Whenever the government must take action in the form of buying or selling dollars in order to maintain the value of the dollar at its fixed rate of exchange, there is a balance of payments deficit or surplus. When there is an excess supply of dollars so that the government has to buy dollars, there is a balance of payments deficit. Conversely, a balance of payments surplus occurs when there is an excess demand for dollars and the government has to sell dollars. A balance of payments deficit then is equal to the excess supply of dollars that results from normal international transactions. When there is a deficit in the balance of payments, it is necessary for the government to carry out special transactions in the form of purchases of dollars in order to maintain the fixed exchange rate. It must pay for those dollars with some of its holdings of reserves.

e. Whether a country with a fixed exchange rate system has a balance of payments surplus or deficit is very important. If it continues to run deficits it may run out of reserves and may no longer be able to maintain the exchange rate. Under a flexible exchange rate system, however, the concepts of surplus and deficit do not have much meaning because the exchange rate always adjusts to the level where the supply of and demand for dollars are equal. Of course, when the supply of and demand for dollars are equal, the deficit (or surplus) must be equal to zero.

.1.4. The Current Account of the balance of payments.

a. If you look at the official U.S. balance of payments for 1974 in Table 9.1, you will find that there are many more items on it than just exports, imports, and changes in reserves. First, you should notice that the balance of payments is divided into a current account and

a capital account. The current account shows all transactions that do not result in the addition to or subtraction from U.S. claims on resources abroad. All transactions that affect the amount of U.S. claims on resources abroad are shown in the capital account. These will be discussed later.

U.S. BALANCE OF PAYMENTS, 1974

(billions of dollars)

Current account	
1. Exports	+98.3
2. Imports	−103.6
3. Net military purchases	−2.1
4. Net investment income	+10.1
5. Net travel and transportation	−2.7
6. Other services	+3.8
7. Unilateral transfers	−7.3
Balance on current account	−3.3
Capital account	
8. U.S. Government net long-term loans	+1.1
9. Private long-term loans and investments	−8.5
10. Private short-term loans and investments	−2.4
11. Errors and omissions	+4.7
12. Net loans by foreign official agencies to the U.S.	+9.8
13. Changes in U.S. official reserves	−1.4
Balance on capital account	+3.3
Overall balance	0

b. Consider now the current account. Remember, items that add to the demand for dollars are shown with a + sign, and items that add to the supply of dollars are shown with a - sign. The two largest items in the current account in 1974 were exports and imports, items 1 and 2.

c. Item 3, net military purchases, represents military purchases from foreign countries including the expenses incurred from maintaining U.S. troops abroad minus the sale of military equipment to foreigners. The entry of -2.1 indicates that the U.S. bought more military goods than it sold because the minus sign represents an addition to the supply of dollars.

d. Item 4, net investment income, represents the income paid to Americans from foreign assets (for example, dividends paid to American stock holders of an Arabian oil company) minus the income paid to foreigners from U.S. assets (for example, interest paid to a German depositer in a U.S. savings bank). Because the entry for this item is +10.1, it added to the demand for dollars, which means that U.S. investment income from abroad was greater than foreign income from the U.S. (If someone had earned, let us say, pounds from a British investment and converted those pounds to dollars, that would have added to the demand for dollars.)

e. Item 5, net travel and transportation, shows the amount spent abroad for these items by Americans less the amount spent in the U.S. by foreigners. Because the entry is negative, this item added to the supply of dollars, which means that Americans spent more on travel and transportation abroad than foreigners spent on these services in the U.S.

f. Item 6, other services includes the purchases of such items as shipping insurance and brokerage services from foreigners by Americans less the purchase of these services from Americans by foreigners. The entry of +3.8 indicates that we sold more of these services to foreigners than we bought from them.

g. The last item in the current account, unilateral transfers, shows the effect on the balance of payments of all gifts and grants to foreigners by Americans less foreigner's gifts and grants to the U.S. The fact that this item is entered with a minus sign means that on balance we were net givers of gifts and grants by an amount equal to $7.3 billion.

h. The balance on current account for 1974 was -3.3. This shows that, adding up all the additions to the supply of and demand for dollars of the various items in the current account, there was an excess supply of dollars of the various items in the current account, there was an excess supply of dollars of 3.3 billion. That is, there was a deficit on current account.

9.1.5. The Capital account

a. Before you can say whether there was a surplus or deficit in the overall balance of payments, it is also necessary to know what happened on the capital account. Table 9.2 reproduces the capital account separately for the U.S. in 1974. In analyzing the capital account, it is essential to understand that when someone in the U.S. buys a foreign asset it is just like an import in terms of its effect on the balance of payments. Thus, for example, when an American business buys a foreign factory or an American bank buys a foreign bond, it will enter the balance of payments account with a minus sign because it adds to the supply of dollars in the same way that imports do.

Also, when a foreigner buys a U.S. asset, the transaction will enter the balance of payments with a plus sign. For example, if a Frenchman buys stock in an American company, he will have to first buy dollars. Consequently, he will be adding to the demand for dollars.

U.S. BALANCE OF PAYMENTS, CAPITAL ACCOUNT 1974

(billions of dollars)

8. U.S. Government net long-term loans	+1.1
9. Private net long-term loans and investments	–8.5
10. Private net short-term loans and investments	–2.4
11. Errors and omissions	+4.7
12. Net loans by foreign official agencies to the U.S.	+9.8
13. Changes in U.S. official reserves	–1.4
Balance on capital account	+3.3

b. The first item in the capital account is U.S. government long-term loans to foreigners. Remember, a new loan is like an import because the government is really buying an IOU of a foreigner. The entry of +1.1 indicates that the U.S. government added to the demand for dollars by reducing its outstanding loans to other countries.

c. Private net long-term loans and investments represent new U.S. investments abroad (including real assets, like new oil wells, and financial assets, like Japanese bonds) minus new foreign investments in the U.S. Because this item was recorded as -8.5 in the balance of payments, it must have been that Americans bought more new assets abroad than foreigners bought in the U.S. in 1974.

d. The next item, private net short-term loans and investments, consists mostly of bank accounts. The recording of -2.4 reflects the increase in Americans' deposits in foreign banks, and so on, minus the increase of foreigners' deposits in U.S. banks, and so on. It indicates that Americans deposited more abroad than foreigners deposited in the U.S. because the minus sign indicates a net import of the IOU's of banks.

e. Errors and omissions (item 11) includes all unrecorded transactions, many of which may be illegal. When an American deposits money in an unnumbered Swiss bank account (that is, imports an IOU from the bank), it shows up in errors and omissions with a minus sign because he adds to the supply of dollars.

f. Item 12 in the U.S. balance of payments reflects the assistance of foreign governments in stabilizing the value of the dollar. Instead of allowing the price of the dollar to fall or forcing the U.S. to sell reserves in order to eliminate the excess supply of dollars resulting from normal transactions, these foreign government agencies agreed to buy the dollars and either exchange them for U.S. government IOU's or deposit them in U.S. banks. Either way, these actions constitute a loan to the U.S. and enter the balance of payments with a plus sign. Even under our new flexible exchange rate system, governments may buy or sell foreign currencies to influence the exchange rate.

g. The last item in the capital account is the change in U.S. reserves. This, of course, represents the sale or purchase of reserves by the government. A sale of reserves is recorded on the balance of paymen-s like any other export. That is, a sale of reserves adds to the demand for dollars and enters with a plus sign. In 1974, this item was -1.4, which means that the U.S. gained reserves in that year. The government can, if it wishes, influence the exchange rate by buying or selling reserves. In 1974 the U.S. government bought $1.4 billion in reserves.

h. The balance on capital account for 1974 was +3.3, which just offset the balance on current account, which it must by definition. Whenever there is a surplus on current account and a deficit on capital account, it means that the amount of goods and services the U.S. is selling and earning in income abroad is greater than it is spending abroad, and it is using the difference to buy more foreign assets. (Remember, a negative sign on capital account represents the purchase of some type of foreign asset whether it be real capital, a bank account, or somebody's IOU.) When there is a deficit on current account, it means the U.S. is earning less than it is spending abroad and is paying for it by borrowing from foreigners. So, if you want to know whether the U.S. is increasing or decreasing its net foreign assets (that is, adding to its net claims against foreigners), you can look either at the balance on current account or the balance on capital account. If the current account balance is positive, the capital account balance will be negative and you will know that U.S. net foreign assets increased.

9.2. The Income-Expenditure Model With Foreign Trade

9.2.1. The foreign component of aggregate demand

a. As was seen in Section 1, some of the expenditure by domestic households, business, and governments is for goods and services produced in foreign countries. This amount is called imports. Conversely, some of the goods and services produced by domestic producers are purchased by foreign households, businesses, and governments. This amount is called exports. To determine the total amount of expenditure for domestically produced goods and services it is necessary to

subtract imports and add exports to domestic consumption, investment, and government expenditure.

b. Another way of determining aggregate demand is to add to C+I+G the amount of net exports (NX), where net exports is the difference between exports and imports. That is, the first equation in the model should be changed to the following:

(1) $E = C+I+G+NX$

c. This change in the model has added a new endogenous variable, i.e., NX. This requires either an additional equation in the model to explain the behavior of the new variable or the assumption that the additional variable is exogenous. While it is reasonable to assume net exports to be exogenous, the volume of imports is likely to depend on the level of gross national income (Y). Consequently, net exports (NX) can be expected to be inversely related to Y as follows:

(2) $NX = n + qY, \quad q < 0$

That is, the higher Y is, the larger imports are and the lower NX will be.

d. Incorporating (1) and (2) into the rest of the income-expenditure model, results in the following model of the goods market:

(1) $E = C + \bar{I} + \bar{G} + NX$

(2) $NX = n + q\ Y$

(3) $C = a + b\ Y_d$

(4) $I = j + h\ \bar{R}$

(5) $Y_d = Y - T$

(6) $Y = E$

For the sake of simplicity, taxes are assumed to be exogenous in the above model. Also, R is assumed to be exogenous for the time being.

9.2.2. Equilibrium in the goods market with net exports

a. It is possible for the model developed in Section 9.2.1 to show how the existence of foreign trade influences the equilibrium level of aggregate demand. This can be done, as with previous models, by solving for Y in terms of parameters and exogenous variables only. The resulting equation is the reduced form equation for Y.

b. The reduced form equation for Y implied by the model of Section 9.2.1 is as follows:

$$(IV) \qquad Y^* = \frac{a+g+n}{1-b-q} - \frac{b}{1-b-q}\bar{T} + \frac{1}{1-b-q}\bar{G} + \frac{h}{1-b-q}\bar{R}$$

c. This equation has several implications. First, an autonomous increase in NX, i.e., an increase in n, will result in an increase in Y*. That is, either an autonomous increase in exports or an autonomous decrease in imports has the same effect on aggregate demand as any other autonomous increase in expenditure for domestically produced goods.

d. Second, the multiplier now includes a parameter from the net export equation. The parameter q, which can be interpreted as minus the marginal propensity to import, enters into the denominator. Since q has a negative sign its presence makes the multiplier smaller. That is, the larger the marginal propensity to import, the smaller will be the multiplier. This makes intuitive sense since a larger marginal propensity to import means that in each round of the multiplier process, there is a smaller induced increase spending for domestically produced goods since more of any increase in income is spent for foreign produced goods.

9.2.3. The capital account

a. To incorporate fully foreign transactions into the model requires a treatment of the capital account as well as the current account. It should be recalled that capital flows can be thought of as imports and exports of financial assets. A capital outflow is like an import in that it represents the purchase of a foreign asset. A capital inflow is like an export in that it represents the sale of a financial asset. The balance of payments surplus (B) will be equal to the amount of net exports (NX) minus the amount of net capital outflows (OF). In equation form this can be represented as follows:

$$(7) \qquad BS = NX - OF$$

b. By including equation (7) into the model adds two variables but only one equation. To complete the model it is also necessary to add an equation to explain the amount of net capital outflows. Since capital flows represent purchases and sales of financial assets, their amounts are likely to depend on the rate of interest. The higher

the rate of interest (R) in the U.S. the more attractive will U.S. financial assets be to foreigners and the less attractive will foreign financial assets be to Americans. Consequently, the higher R the smaller will be net capital outflows. That is,

(8) $OF = r + s\bar{R}, \; s < 0$

d. By substituting Y* for Y in equation (8) and equation (2) for NX and equation (8) for OF in equation (7), leaves the following implication for the balance of payments surplus:

$$BS = n + r + qY^* - s\bar{R}$$

That is, the higher Y* the lower BS will be (since q 0) and the higher $\bar{R}$, the higher BS will be (since $s < 0$). That is, when aggregate demand increases, the balance of payments surplus tends to decrease since imports rise and when the rate of interest increase the balance of payments surplus tends to increase since net capital outflows tend to decrease.

e. Consequently, a balance of payments deficit can be reduced either by contracting aggregate demand (to reduce imports) or by increasing R (to increase capital inflows).

9.2.4. Flexible exchange rates

a. The foregoing analysis was made under the implicit assumption that the exchange rate was fixed. The question arises as to how the level of aggregate demand behaves under a system of flexible exchange rates. Two conclusions can be drawn under a flexible exchange rate system.

b. First, given $\bar{R}$, and consequently OF, anything that tends to increase NX will generate a change in the exchange rate which will return NX to its initial level. Consequently, under a system of flexible exchange rates, the balance of payments surplus will not depend on the level of Y. Since exchange rate adjustment will always bring the balance of payments surplus to zero by causing changes in exports and imports.

c. Second, it will not be necessary in order to eliminate a balance of payments deficit to rely either on a tighter monetary policy (higher R) or to engineer a reduction in aggregate demand (Y*). It should be possible to achieve a balance of payments deficit of zero through

exchange rate adjustments without sacrificing internal or domestic policy objectives.

9.3. International Monetary Arrangements

9.3.1. Fixed versus flexible exchange rates.

a. An important question to answer is why we ever had a fixed exchange rate system when it creates the problem of having always to undertake special transactions to preserve the fixed exchange rate. Why not, in other words, allow exchange rates to adjust to where the quantities supplied and demanded for each currency are equal? The two extreme alternatives then are: (1) a fixed exchange rate system, which requires the government to buy or sell reserves to eliminate any excess supply of or demand for its currency: and (2) a flexible exchange rate system in which the exchange rates adjust to bring about equality of the quantities supplied and demanded for each currency.

b. In deciding among these and any other alternative international monetary arrangements, a more fundamental question must be answered first: What are the purposes of any such arrangement? The generally agreed-upon answer to this question is that the best international monetary system is the one that does the best job of encouraging the free flow of goods and services between countries. That is, the goal of the system should be to encourage international exchange of goods, services, and resources. The reasons for encouraging trade is that trade between countries results in a more efficient allocation of resources and higher world per capita income.

c. The main reason that many people believed that a fixed exchange rate system would do a better job of promoting trade between countries was that under such a system importers and exporters would not have to worry about whether the exchange rate would rise or fall. The fear was that under a flexible exchange rate system, the exchange rate would fluctuate a great deal, thereby causing the prices of foreign goods to fluctuate a great deal and make imports appear to be a good buy one day and a bad buy the next. Actually, very little was known about how a flexible exchange rate system would operate because it

had not been tried extensively for very many years. But the government officials of most of the major trading nations believed a fixed exchange rate system to be superior. This system, however, creates problems for these governments.

d. One of these problems is sometimes called the liquidity problem. Under a fixed exchange rate system, some countries will undoubtedly have a deficit in their balance of payments. That is, normal transactions will result in an excess supply of their currencies. This will require the governments of these countries to buy their currencies (that is, to sell reserves) if the fixed exchange rate is to be preserved.
In order for this to be done by each country when it has a balance of payments deficit, it is necessary for each country to have an ample supply of reserves. In the past when gold was the main form of international reserves, the supply depended largely on gold discoveries. Many felt that there was not a sufficient growth in the supply to fully satisfy the needs of governments for reserves to finance their balance of payments deficits.

e. But even if there were ample reserves in the international monetary system, there would still be what is called the adjustment problem. The adjustment problem arose whenever a country's fixed exchange rate was persistently above or below the equilibrium rate. When the former occurred, the country always had a balance of payments deficit. In this circumstance, the currency was said to be overvalued. When a country had an overvalued currency, it tended to have a continuing balance of payments deficit.
No matter how much reserves a country had, it could not continue to run a deficit forever. As the deficit continued, the country would lose reserves and eventually run out of reserves. Before that happened, it would have to eliminate its balance of payments deficit or no longer be able to fix its exchange rate. This is the adjustment problem.

9.3.2. Balance of payments adjustment under fixed exchange rates.

a. There are a number of actions a government could take to eliminate its balance of payment deficit. One would be to reduce its domestica price level relative to foreign price levels by having a lower rate of inflation than other countries. With a lower rate of inflation,

its price level would fall relative to foreign price levels and its goods would become cheaper relative to foreign goods. This would result in an increase in exports and a decrease in imports and a reduction in the balance of payments deficit.

b. An alternative policy would be for the deficit country to increase its rate of interest. This would make it more attractive for foreigners to make loans to that country and reduce the incentive for citizens to invest in bonds and other securities abroad. By increasing foreign investment at home and reducing its citizens' investment abroad, it would be possible to reduce the payments deficit.

c. A major difficulty with either of these policies was that they might interfere with the country's domestic economic objectives regarding full employment. Reducing aggregate demand to reduce the rate of inflation or raising interest rates to attract foreign capital was likely to result in a rise in unemployment. Thus, to use either of these policies would involve sacrificing the goal of full employment in order to reduce the balance of payments deficit.

d. Because of the costs of these policies, they were rarely pushed to the limit, although some economists explain the failure of government to fight the Great Depression vigorously at its inception in part on the Federal Reserve's preoccupation with the balance of payments deficit. Also, a number of recent British recessions have been blamed on the government's attempt to solve its balance of payments problems by reducing aggregate demand. But, if these policies could not be used actively to solve a balance of payments problem, other measures had to be adopted. Unfortunately, many countries faced with balance of payments difficulties have adopted policies (such as tariffs, quotas, controls on capital movements, and so on) that restrict trade. The difficulty with such policies was that they compromised the objective that the fixed exchange rate system was set up to achieve, namely, the encouragement of international trade.

9.3.3. Exchange rate adjustment.

a. Often when a currency was overvalued, because of the difficulty of

solving the adjustment problem any other way, it became necessary to change the exchange rate. To eliminate a chronic balance of payments deficit, a country should lower the price of its currency relative to other currencies. This is called depreciation of the currency. When a currency depreciates, its price falls relative to other currencies, thereby making that country's exports more attractive and imports from abroad less attractive.

b. In 1971, there was a general realignment of the fixed exchange rates. The dollar, which had been repeatedly in excess supply, was depreciated relative to most European currencies and the Japanese yen. At the same time, there was a devaluation of the dollar relative to gold. That is, in addition to its changed price relative to other currencies, the dollar also changed relative to gold. The official price of gold rose from $35 to $37.80 per ounce. Although this received a good deal of attention in the newspapers, in terms of solving the adjustment problem, the devaluation of the dollar in terms of gold was not at all important. What did matter was the depreciation of the dollar relative to other countries' currencies. This is particularly true since the U.S. no longer will exchange gold for dollars. Previously, the U.S. guaranteed convertibility of dollars into gold. Now that there is no longer convertibility of dollars into gold, the price of dollars in terms of gold has no direct bearing on the adjustment problem. Actually, the devaluation of the dollar in terms of gold had the effect of helping to solve the liquidity problem. In terms of dollars, it had the effect of increasing the value of gold reserves. In other words, the devaluation of the dollar served to increase the amount of reserves for those countries who held gold as part of their reserves.

c. The 1971 changes in exchange rates were not destined to last for long. The U.S. gave responsibility for maintaining the new exchange rates to its trading partners. Early in 1973 the United States announced that it would devalue the dollar by 10 percent. That is, it announced that it would lower the dollar price of gold by 10 percent. This led other countries to announce that they would no longer attempt to fix the exchange rate between their own currency and

and the dollar. As a consequence, the exchange rates for major currencies became flexible.

d. Since 1973, exchange rates have remained flexible, although they have not been determined completely by private market forces. Governments have bought and sold foreign currencies in order to keep the exchange rate from fluctuating too widely. For example, items 12 and 13 in Table 9.2 show how actively governments participated in the foreign exchange market in 1974. Item 12, Net loans by foreign official agencies to the U.S., shows the amount of short-term dollar liabilities (for example, bank accounts) acquired by foreign governments to keep the price of the dollar from falling. This amount was $9.8 billion.

3. Item 13, Changes in U.S. official reserves, shows the amount of foreign currencies bought (-) or sold (+) to influence the exchange rate. In 1974, the U.S. bought foreign currencies in the amount of $1.4 billion. Since 1973 there have been negotiations among governments in an attempt to formalize an agreement on a new international monetary system. In the meantime, we have had a system in which governments do intervene to influence exchange rates, but do not try to fix them at any publicly announced levels.